Test Equipment Depot
1-800-517-8431

User Manual

Tektronix

MTS400 Series
MPEG Test Systems

Volume 2 of 2

071-1507-01

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

Table of Contents - Volume 1

General Safety Summary xi

Service Safety Summary xiii

Preface xv
Related Material xv
Manual Conventions xvi

Introduction

MTS400 Series Software Application 1-1

Transport Stream Compliance Analyzer

Getting Started 2-1
TSCA Features 2-2
Deferred and Real-Time Modes 2-2
Technical Background 2-3
User Interface 2-3
Capture Vut Feature 2-5
Triggered Recording 2-5
Starting the TSCA Software 2-6
Setting Up the IP Interface 2-12
Setting the Stream Content Font 2-15

Understanding the Analyzer Window 2-19
TSCA Window Components 2-20
Error Status LEDs 2-24
Context Menus 2-25

Using the Program View 2-27
Program Navigation - Transport Stream Node 2-29
Program Navigation - Program Nodes 2-34
Program Navigation - Elementary Stream Node 2-35

Using the Tests View 2-39
Test Structure 2-41
Tests Navigation - All Tests 2-43
Test Navigation - Test Nodes 2-43
Test Navigation - PID Nodes 2-44

Using the Tables View 2-45
Table Summary Pane 2-46
Tables Detail View - Section View 2-47
Tables Detail View - SI Repetition Graphs 2-49

Using the PID View 2-51
PID View - All PIDs 2-52
PID View - Detail View (All PID and Group) 2-53
PID View - Detail View (PIDs) 2-54

Using the Packets View 2-57
Packet Navigation Bar 2-58
Packet Navigation - PIDs node 2-59
Packet Detail View 2-59

Common User Interface Concepts 2-63
Windows Management 2-63
Icons 2-65
Graph Management 2-68
PCR Graphs 2-74
PTS Graphs 2-78
Bit Rate Graphs 2-80
Parameter Edit 2-81
Event Log 2-84
Bit Rates 2-89
EPG View 2-93
MPE Views 2-98
CaptureVut Feature 2-99
Triggered Recording 2-105
Menu Bar and Options 2-109
Preferences 2-112
Script Files 2-114

Task Examples 2-119
Which Tests Have Failed in an Analyzed Stream? 2-120
How Many PIDs are in a Stream? How many PIDs are Referenced and Unreferenced? 2-122
Which Tests Have Been Applied to a Program PID? 2-123
What is the Stream Type of a PID? 2-124
How Many Programs are in the Stream? 2-125
What are the Contents of the Programs and What PIDs are They On? 2-126
What is the Bit Rate of each PID in a Program? 2-127
What is the Latest Version Number of the Program Association Table (PAT) in the SI? 2-130
How do I Examine a Transport Packet? 2-131

SI/PSI Nodes 2-133

PES Analyzer

Getting Started 3-1
Starting the Program 3-2
Options 3-5
Opening a File 3-8

Menus and Controls 3-11
Toolbar 3-11
Status Bar 3-13
Slider Bar 3-14
Menus and Options 3-17

Packet Hex View 3-21
Packet Header 3-22

Event Log 3-25
Packet Selection 3-25

Packet Header Interpretation **3-29**
Program Structure **3-33**
The Diagram 3-34
Selecting a Packet Type 3-35
PTS/DTS Timing Analysis **3-37**
Access Unit Selection 3-40
Scrolling the View 3-40
Video Streams 3-41
Audio Streams 3-43
AC-3 Audio Streams 3-45
AAC Audio Streams 3-46

T-STD Buffer Analyzer

Getting Started **4-1**
Suitable Streams 4-1
Table Handling 4-2
Starting the Program 4-2
Settings 4-4
Opening an MPEG File 4-8
Opening a BMR File 4-9
Window Layout 4-10
Initial Processing of MPEG Files 4-11
Initial Processing of BMR Files 4-12
Menus and Controls **4-13**
Toolbar 4-13
Status Bar 4-15
Menu Options 4-16
Stream List **4-19**
Selecting Streams 4-21
Processing Streams 4-21
Event and Message Logs **4-23**
Global Event Log 4-23
PID Event Log 4-24
Detail Message Logging 4-25
Results Graphs **4-27**
Common Features 4-27
Elementary Buffer Graph 4-36
Multiplex or Main Buffer Graph 4-37
Transport Buffer Graph 4-38
Detail Message Logging 4-39

Elementary Stream Analyzer

Getting Started **5-1**
Starting the ES Analyzer 5-2
Opening an MPEG Stream 5-3
Understanding the Main Window and Icons 5-5
Tree View and Navigation 5-8
Header, Extension and Hex Displays 5-10

Error Testing Methods and Outputs 5-15
Run Through Stream Test Mode 5-16
Error Filtering 5-17
Status Bar 5-23
Regression Testing and Error Log Files 5-24
Reports and Field Selection 5-27
Demultiplexing Transport Streams to PES or Elementary Output Files 5-30

Working with Transport and PES Streams 5-31
Using Packet View 5-31
Understanding PES 5-32

Working with Video Streams 5-35
Viewing the Sequence Header 5-36
Viewing the GOP and Picture Header 5-37
Displaying the Slice and Macroblock 5-42
Analyzing Picture Quality 5-44
Using the Video Viewer for Picture Analysis 5-57

Working with Audio Streams 5-61
Understanding MPEG Audio Streams 5-61
Audio Player 5-62
Understanding Dolby Digital (AC-3) Audio Streams 5-68

Working with Program Streams 5-71
Viewing Pack and System Headers 5-72
Viewing the Program Stream Map 5-73

Working with Teletext 5-75
VBI (Enhanced Teletext Support) 5-76

Advanced Audio Compression 5-79
ADIF Stream Forms 5-81
ADTS Stream Forms 5-89

Closed Caption Analysis 5-91
Enabling Closed Caption Analysis 5-91
Selecting Closed Caption Analysis Standard 5-92
CC-EIA608 Support 5-93
CC-EIA708 Support 5-94
Dumping Closed Caption Statistics 5-98

DVB Subtitle Stream Analysis 5-101
DVB Subtitle Data Tab 5-103
Page View Tab 5-106

Table of Contents - Volume 2

General Safety Summary xi
Service Safety Summary xiii
Preface xv
Related Material xv
Manual Conventions xvi

Carousel Analyzer

Getting Started 6-1
Data Broadcasting Overview 6-3
Starting the Program 6-4
Menus and Controls 6-13
Menu Options 6-13
Toolbars 6-17
Transport Packet Bar 6-19
Status Bar 6-20
Workspace 6-21
Views 6-27
Programs/Services View 6-30
Object Carousel View 6-34
U-N-Download View 6-41
Data Carousel (DVB) View 6-45
Data Carousel (ARIB) View 6-46
Resource View 6-50
Structure Views 6-52
Bitrate View 6-55
Repetition View 6-58
PID View 6-61
Log View 6-64
Cycle Times View 6-67
Application Support 6-71
Application Management 6-71
Application Definition 6-73
Application Timing 6-78
MHP Support 6-91
Right-Click Menu Options 6-92
Application Lifetimes 6-93
Reference 6-95
Script Files 6-95
Error Checking 6-96
Acronyms and Abbreviations 6-97
References 6-98

Carousel Generator

Getting Started **7-1**
Data Broadcasting Overview 7-1
Carousel Generator Overview 7-2
Starting the Application 7-6

Carousel Wizard **7-9**
Step 1: Select Carousel 7-11
Step 2: Carousel Properties 7-12
Step 3: Carousel Contents 7-13
Step 4: Collection Contents 7-15
Step 5: Imported Elementary Streams 7-18
Step 6: Program Entry 7-20
Step 7: Output Stream Properties 7-21
Step 8: Congratulations 7-22

Menus and Controls **7-23**
Menus Options 7-23
Toolbars 7-27
Log Window 7-30
Status Bar 7-31
Properties Window (List Control) 7-31

Carousel Generation **7-33**
Setting Overall Carousel Generator Properties 7-33
Creating a Session 7-39
Selecting the Carousel Type 7-41
Modifying the Carousel Properties 7-42
Carousel Contents 7-51
Collections 7-66
Programs 7-70
Output Stream Generation 7-79
Carousel Definition File 7-79

PSI and SI in the Carousel Generator Output Stream **7-81**
PSI/SI Mode Settings 7-81
MPEG PSI tables 7-82
DVB SI Tables 7-89
Summary 7-103

Multiplexer

Getting Started **8-1**
Starting the Program 8-3
Scripts 8-5
Opening a Stream 8-9
Closing Files 8-14

Menus and Controls **8-15**
Menu Options 8-15
Toolbar 8-19
Status Bar 8-20
User Interface 8-21

Wizards **8-27**
Transport Wizard 8-28
Program Wizard 8-33

Views **8-43**
Navigator Views 8-44
Section View 8-47
Structure Diagram Manipulation 8-56
Event Log 8-57
Examine Transport Stream Window 8-58
SI Filtering 8-61
Component Views 8-65
Common Menu Options 8-74

Editing in the Navigator Views **8-75**
Drag and Drop 8-75
Transport Stream 8-76
Programs 8-77
Tables 8-79
Sections 8-82
ES PIDs 8-91
DSM-CC 8-100

Editing in Section View **8-103**
Editing Fields 8-104

Multiplexing Transport Streams **8-111**
Start 8-111
Errors and Reporting 8-112
Stop 8-113
Exporting the Multiplex Configuration File 8-114

Make Seamless **8-117**
Enabling the Seamless option 8-117
Seamless Settings 8-118

Reference **8-119**
Abbreviations 8-119

Transport Stream Editor

Getting Started **9-1**
Starting the Program 9-2
Options 9-3
Opening a File 9-4

Menus and Controls **9-7**
Toolbar 9-7
Status Bar 9-8
Slider Bar 9-9
Menu Options 9-11

Hex Editor **9-15**
Color Coding 9-15
Selecting & Editing 9-17

Header Editor **9-21**
Header Information Tab 9-21
Adaptation Field Tab 9-23
Adaptation Field Extension Tab 9-26
PID Remapping **9-29**
PCR Recalculation **9-33**
Jitter Functions 9-38

MPEG Player

Getting Started **10-1**
Display Elements 10-1
Hierarchical Display 10-7
Menus and Controls **10-19**
Menus in the Play Screen 10-19
Menus in the Record Screen 10-37
Toolbar Buttons 10-42
Reference **10-45**
Interface Card (SPI/ASI/310M Option) 10-45
Adding Jitter to PCRs 10-46
Using Preset Files 10-49
Using the Continuous Recording Feature 10-50
Performing Continuous Recording 10-52
Remote Commands 10-54

Tracer

Getting Started **11-1**
Important Information about Tracer 11-1
Setting Up Tracer and Buffer Analyzer 11-2
Starting Tracer 11-4
User Interface 11-4
Menus and Controls **11-11**
File Menu Options 11-11
Edit Menu Options 11-12
Print Menu Options 11-13
View Menu Options 11-14
Show Menu Options 11-15
Help Menu Options 11-16

Make Seamless Wizard

Make Seamless Wizard **12-1**
Starting the Wizard 12-1
Selecting an Input File 12-2
Select a Program to Make Seamless 12-7
Selecting a Multiplex Output File 12-10

Transport Stream Cutter

Transport Stream Cutter 13-1
Starting the Wizard 13-1
Cutting a File 13-2

Script Pad

Getting Started 14-1
Setting Up 14-1
Starting the Program 14-1
Initial Appearance 14-2
Initial Menu Options 14-3
Script File Appearance 14-3
Opening a File 14-4
Menu and Controls 14-7
Menu Bar 14-7
Toolbar 14-9
Status Bar 14-10
Script File Editing and Encryption 14-11
Keyword Color-Coding 14-11
Parsing 14-11
Encryption 14-12

Glossary

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Power Disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Terms in this Manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and Terms on the Product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbols may appear on the product:

CAUTION
Refer to Manual

Protective Ground
(Earth) Terminal

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Preface

This manual describes the functions and use of the MTS400 Series MPEG Test System. After the introduction, each section of the manual describes one of the software applications or tools that make up the MTS400 Series system.

- *MTS400 Series MPEG Test System Getting Started Manual* (071-1505-xx).
- *MTS400 Series MPEG Test System Programmer Manual* (071-1725-xx). This manual specifies the remote control and status monitoring interfaces available to a management application.

Related Material

Additional documentation, such as Read Me files, may be included on the installation disks.

The following URLs access the Web sites for the standards organizations listed (the URLs listed were valid at the time of writing):

- MPEG-2 standards (International Organization for Standards) http://www.iso.ch/
- DVB standards (European Technical Standards Institute) http://www.etsi.org/
- ATSC standards (Advanced Television Systems Committee) http://www.atsc.org/
- ISDB/ARIB standards (Association of Radio Industries and Businesses) http://www.arib.or.jp/english/
- SCTE Society of Cable Television Engineers http://www.scte.org/

Manual Conventions

Naming conventions for the interface elements are based on standard Microsoft Windows naming conventions. Naming conventions for MPEG-2, ATSC, and DVB structures follow the conventions derived from the standards listed above. In addition, the following formatting conventions apply to this manual:

- **Bold** text refers to specific interface elements that you are instructed to select, click, or clear.
  Example: Select **Settings** from the Configuration menu.
- Mono-spaced text can indicate the following:
  - Text you enter from a keyboard
    Example: Enter the network identity (`http://TSMonitor01`)
  - Characters you press on your keyboard
    Example: Press CTRL+C to copy the selected text.
  - Paths to components on your hard drive
    Example: The program files are installed at the following location:
    `C:\Program Files\Tektronix\`

Carousel Analyzer

Getting Started

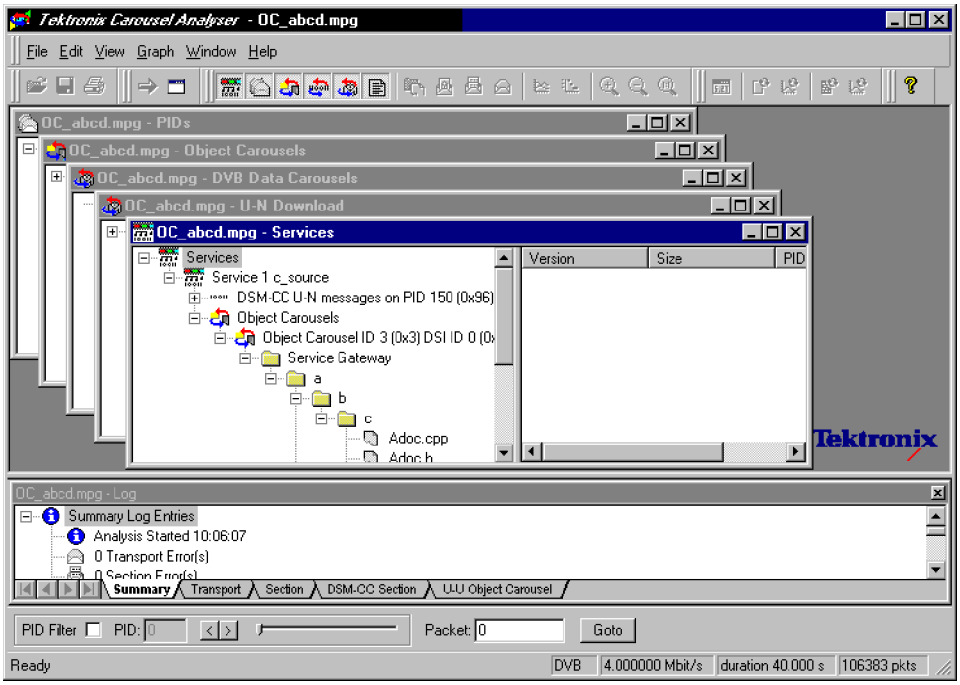
The Digital Storage Media Command and Control (DSM-CC) protocol was originally developed to provide a VCR-like control mechanism for program material delivered in an MPEG2 transport stream. Since then, the standard has evolved to encompass a wide variety of applications including data broadcasting and interactive television. DSM-CC forms a core part of a variety of both closed and open standards such as the DVB MHP (Multimedia Home Platform) standard for European Interactive Television.

The following DTV standards are supported:
(See page 6–98 for details of all references in this section.)

- ISO/IEC 13818-6 Information technology - Generic coding of moving pictures and associated audio information - Part 6: Extension for Digital Storage Media Command and Control [MPEG] (Reference [2])
- EN 301 192 Specification for data broadcasting [DVB] (Reference [4])
- ARIB STD - B24 Data Coding and Transmission Specification for Digital Broadcasting (Reference [11])
- Multimedia Home Platform [DVB] (Reference [12])

A bibliography of DTV standards documentation is given in the *Reference* section.

The Carousel Analyzer has been developed to meet the specific need to analyze and display the content and structure of data broadcasts. The tool provides a variety of ways of looking at a transport stream and its contents including displaying the bit rate, repetition rates, structure, syntax, and semantics of data items.



The program view shows the various services in the transport stream and their associated PIDs and data streams. Object or data (one or two layer) carousels and U-U or U-N messages such as DSM-CC Download can also be displayed with options to view associated, sections, carrier modules, or transport packets for each version as required.

An object carousel in the stream can be viewed by contents as a directory structure containing the underlying objects such as Java classes, picture, or text files. If an object is associated with an installed application then a double-click will launch that program, providing, for example, an easy and quick way to view the contents of a picture file or read a text file.

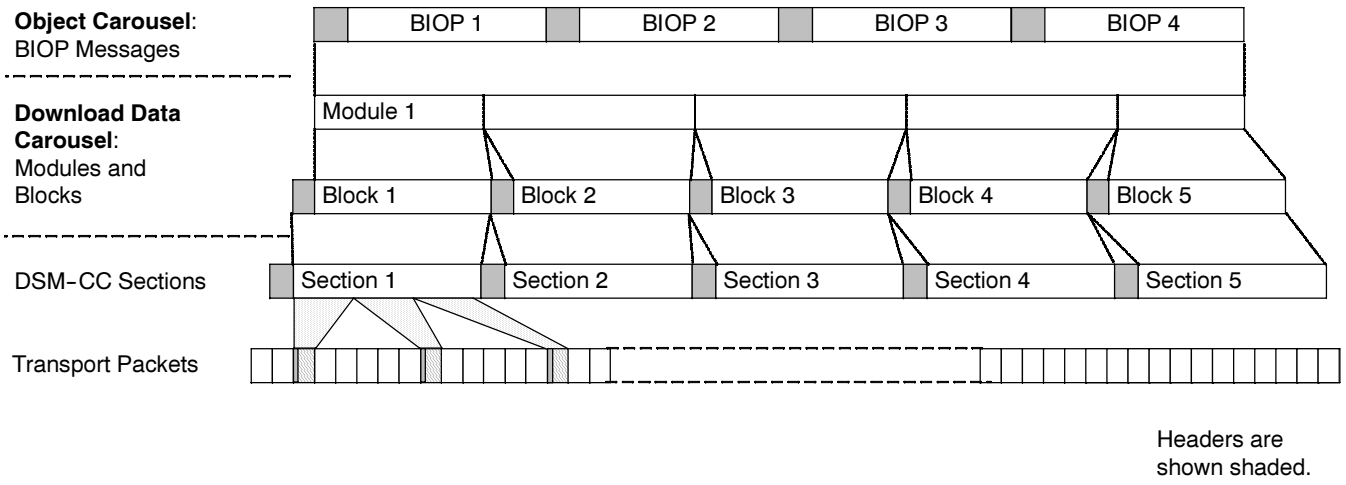
The structure of the U-N download messages can be viewed showing the relationship between DII, modules and blocks. The associated DSI and DII messages contained in the U-N-Download tables can also be viewed in interpreted or hex fashion; these indicate where to find and view the BIOPs that contain a required object in the stream.

The timing relationships between the various components can also be easily shown because the bit rates or the repetition rates of blocks, modules, objects, U-N messages or SI tables can be shown together in a single graphical display.

Data Broadcasting Overview

Data Broadcasting allows data to be transmitted in asimilar way to the way in which video and audio services are delivered to end users. Object and Data Carousels are intended for the periodic transmission of information in a transport stream. DVB Data Carousels contain modules of data of unspecified content. ARIB Data Carousels and Object Carousels contain identifiable data objects, for example, JPEG files, text files, and application software. Multimedia Home Platform (MHP) is also supported because the Application Information Table (AIT) and Object Carousels (as specified in the MHP standard) can be viewed.

The diagram below shows how information carried by data and object carousels is subdivided and ultimately carried by the transport stream.



BIOP messages contain a message header, a message sub-header and the message body which contains data. The message body may contain complete data objects.

BIOP messages are broadcast in Modules. A Module is formed from one or more concatenated, complete BIOP messages.

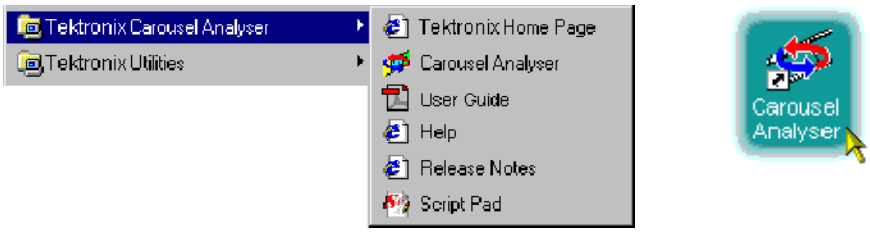
Each Module is fragmented into one or more Download Data Blocks which are in turn transmitted in corresponding DSM-CC Sections.

Sections are transmitted in packets in the Transport Stream.

The Carousel Analyzer enables each layer of the protocol stack to be analyzed and inspected. The following sections provide an overview of how the Carousel Analyzer can be used to locate messages and packets of interest.

Starting the Program

The program can be started by selecting the **Carousel Analyzer** option from the **Start > Programs > Tektronix Data Applications V2.0** menu or by double clicking on the **Carousel Analyzer** shortcut on the desktop.



Initial Appearance

When the program has started and is ready for use, it will open the Main window, as shown in Figure 6–1:

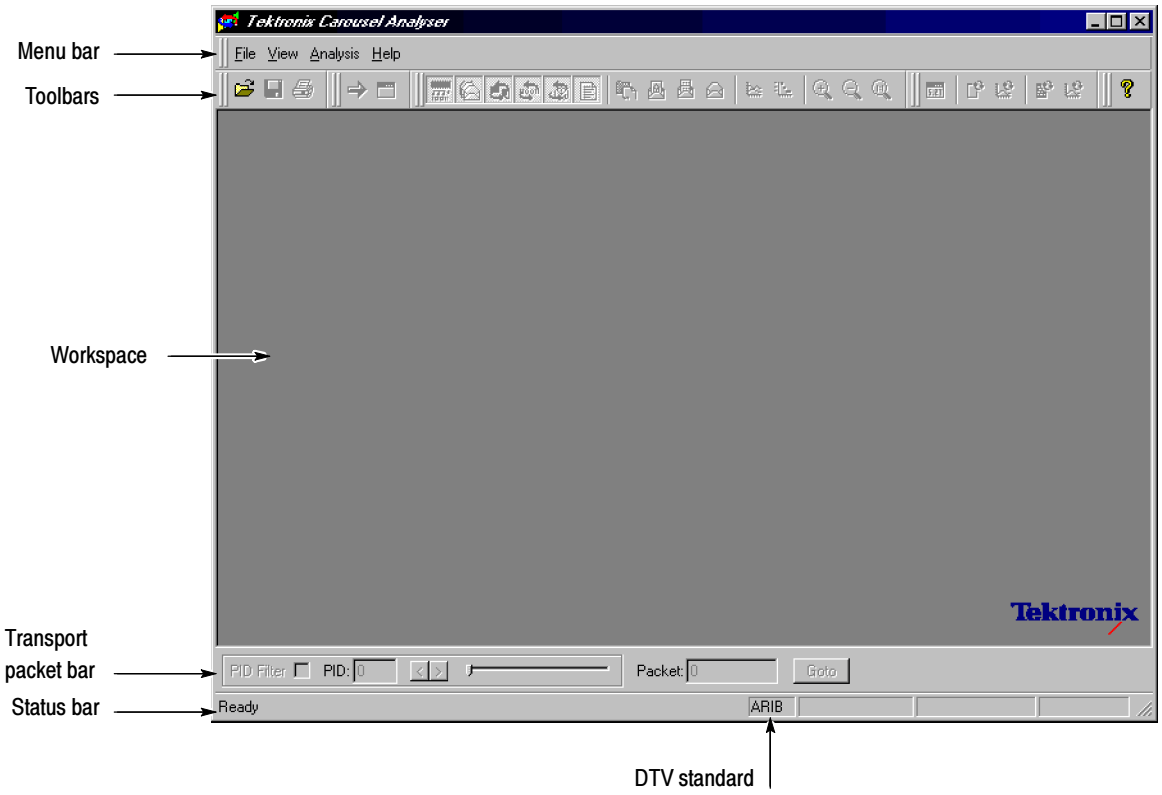


Figure 6-1: Main Window - Intial Appearance

Elements of the main window can be hidden during a session, but will be restored at start-up.

The Menu Bar contains all options available to the application; disabled options are visible but grayed out. The Toolbars provide shortcuts to the more important menu options; similarly, disabled buttons are visible but grayed out. The Transport Packet Bar provides controls to locate and jump to transport packets. The Status Bar shows stream information and the cursor message field.

Initial Menu Options

The Carousel Analyzer presents different menus and options depending upon whether or not a stream is open for analysis. The menu options available when no stream is open are as follows:

File Menu Options. Table 6–1 lists the options in the initial File menu.

Table 6-1: File menu options

Option	Function
Open...	Opens an MPEG transport stream for analysis. The program opens the file selection dialogue allowing the user to choose the required file.
Print Setup...	Opens a dialog for selecting which printer and associated options to use.
1 <<filename>> **2** <<filename>> **3** <<filename>> **4** <<filename>>	A list of the four most recently analyzed files. If the program has recently been installed, the list may be empty or hold less than four files. Selecting a filename opens that file for analysis.
Exit	Finishes running the program.

View Menu Options. Table 6–2 lists the options in the initial View menu.

Table 6-2: View menu options

Option	Function
Toolbars >	Submenu shows or hides the toolbar.
Transport Packet Bar	Shows or hides the Transport Packet Bar.
Status Bar	Shows or hides the status bar.

Analysis Menu Options. Table 6–3 lists the options in the initial Analysis menu.

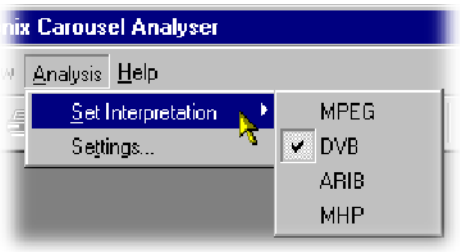
Table 6-3: Analysis menu options

Option	Function
Set Interpretation >	Select the Digital TV standard to be used for stream analysis.
Settings...	Displays a dialog for selecting scripts to be used during analysis.

Stream Interpretation

The DTV standard to be used for analysis must be selected before any streams are opened.

Select the required standard from the submenu.



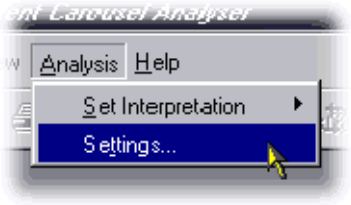
Script Selection And Manipulation

Scripts are available to the Carousel Analyzer to enable structures to be analyzed successfully.

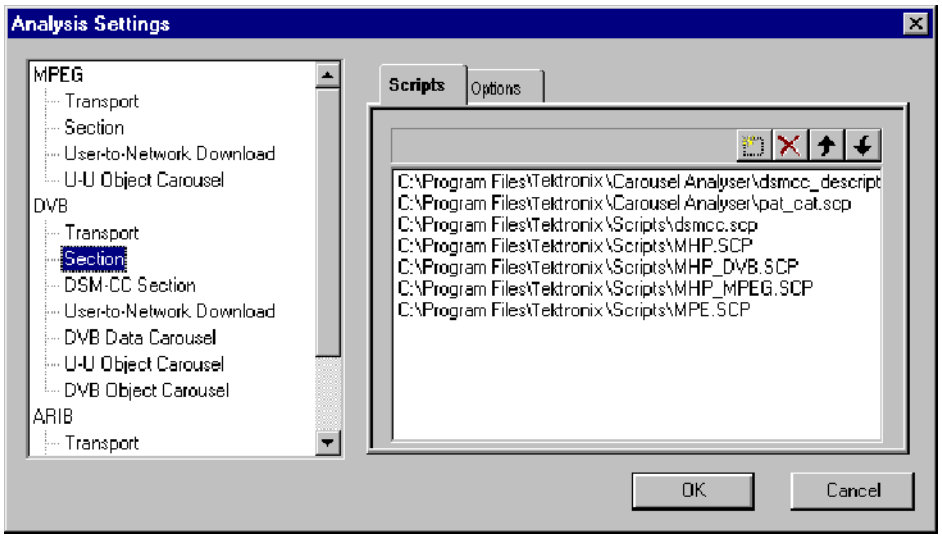
If any script is not selected or enabled, the stream will not fail to be analyzed, but any data normally interpreted by that script would be ignored.

Scripts can only be selected and enabled when no files are open. The option is not available when a file is open.

Handling Script Files. To open the Analysis Settings dialog box, select Settings... from the Analysis menu.



The dialog box shown below is displayed:



In the Analysis Settings dialog, the left window shows a tree structure of the test protocols available. The right window shows the scripts currently allocated to the test protocol; in the example, the listed scripts are associated with the DVB - Section protocol. The right window also contains the controls needed to manipulate the scripts.

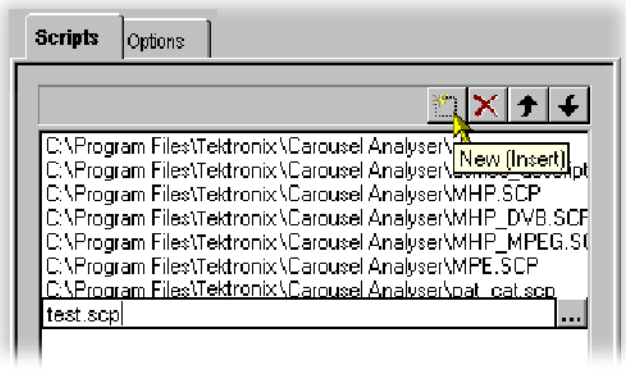
Note that across the standards, the scripts are not hierarchical; that is, each DTV standard must be self-contained in terms of the scripts that it uses.

The currently available script files are listed in the *Reference* section (page 6–98).

The following paragraphs describe the available script manipulation activities. The activities are applied to the currently selected test protocol.

Adding a Script file.

1. With the required test protocol highlighted, select the Add New Script button (Shortcut key: Insert).
2. If the script path/name is known, enter it into the blank field.

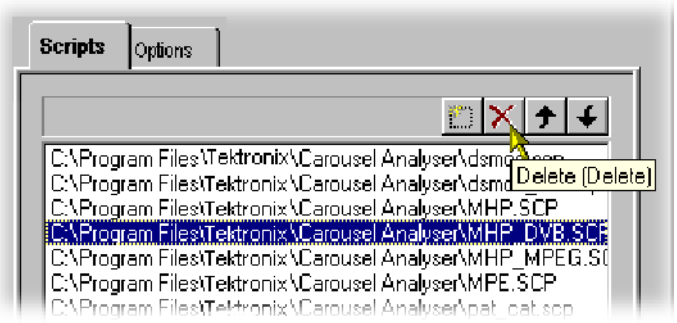


If the script name is unknown, use the browse button at the right side of the blank field to display a standard Windows file Open dialog box.

3. The new script file name will be added at the bottom of the script list. Note that script files are parsed in the order that they are listed, because the file may require moving up in the list – see *Moving Script files in the list* below.

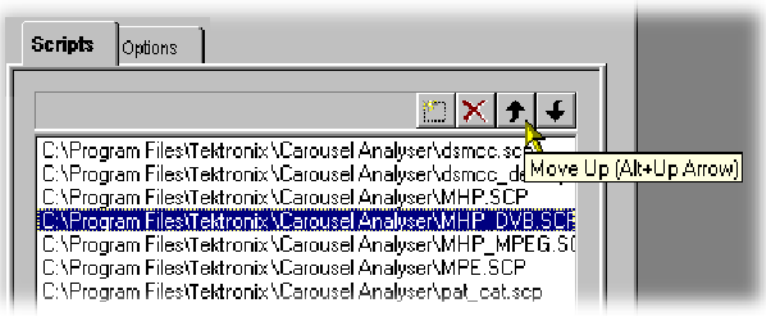
Removing a Script File.

1. Highlight the file to be deleted and select the Delete Script button (Shortcut key: Delete).



Moving Script Files in the List Script files are parsed in the order that they are listed; the file may require moving up in the list

1. Highlight the file to be moved and select either the Move Up or Move Down button (Shortcut keys: Alt-▲ and Alt-▼ respectively). The file will move up or down one place for each press of the button.



Syntax Checking Options

A number of options are available from the Analysis Settings dialog that allow strict syntax checking to be enabled and disabled.

If any option is not enabled, the relevant syntax will not fail to be checked, but will be interpreted more loosely.

Syntax Checking Options can only be selected and enabled when no files are open. The option is not available when a file is open.

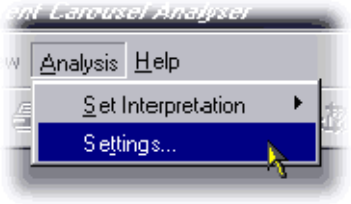
Currently, three syntax checking options are available:

Strict private data length/Message length checking. Object: U-U Object Carousel
Disabling this option allows the privateDataLength field where it exists in the DSI to be set to zero. The application will calculate it when required, using the total message length and the position of the private data in the message.
(See reference [2], sections 2 and 7.3.6.)

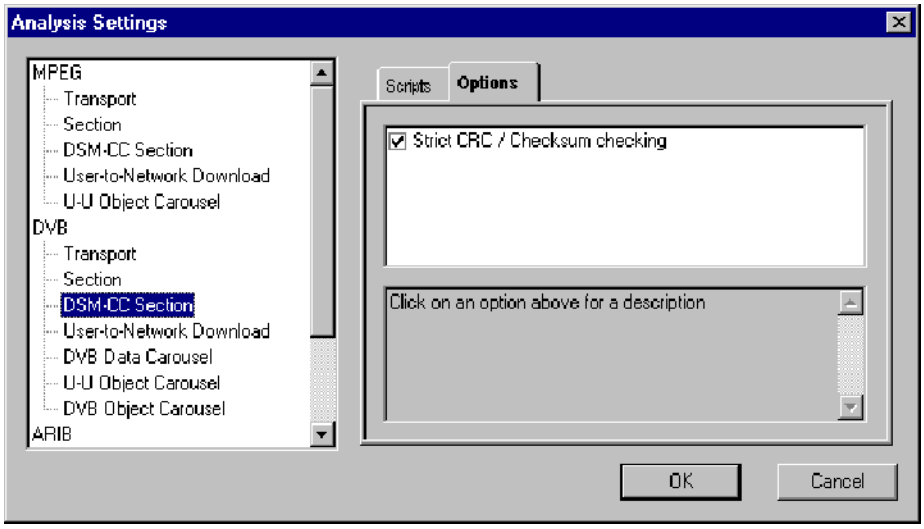
Strict association tag checking. Object: U-U Object Carousel
The association tag field in the stream_identifier_descriptor is an 8-bit value, while the same field in an object carousel is a 16-bit value. When comparing these two values, the MSB of the 16-bit value should be zero. Disabling this option allows it to take other values.
(See reference [4], 9.3 paragraph 3 and [6], paragraph 4.7.7.3.)

Strict CRC/Checksum checking. Object: DSM-CC Section
section_syntax_indicator and private_indicator fields should be the complement of each other to determine whether a CRC or checksum is in use. Disabling this option allows them to be the same and allows the application to work out which method should be applied.
(See reference [2], section 9.2.2 paragraphs 3 and 4.)

Enabling a Syntax Checking Option. To open the Analysis Settings dialog box select Settings... from the Analysis menu.



Select the Options tab. The dialog shown below is displayed:

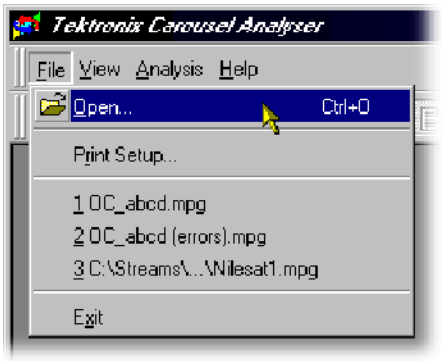


In the Analysis Settings dialog box, the left window shows a tree structure of the test protocols available. The right window shows the options currently allocated to the test protocol; note that currently, options are only applicable to DSM-CC Sections and U-U Object Carousels. Available options are applicable to all standards, for example, an option set in the DVB DSM-CC Section will be applied in the MPEG and ARIB protocols.

Opening a Stream File

Any Transport Stream file can be opened for browsing by the Carousel Analyzer. However, only those streams containing Data and/or Carousel Objects will provide meaningful results. Transport Stream Analyzer should be used for normal stream analysis. Only one file can be opened at a time.

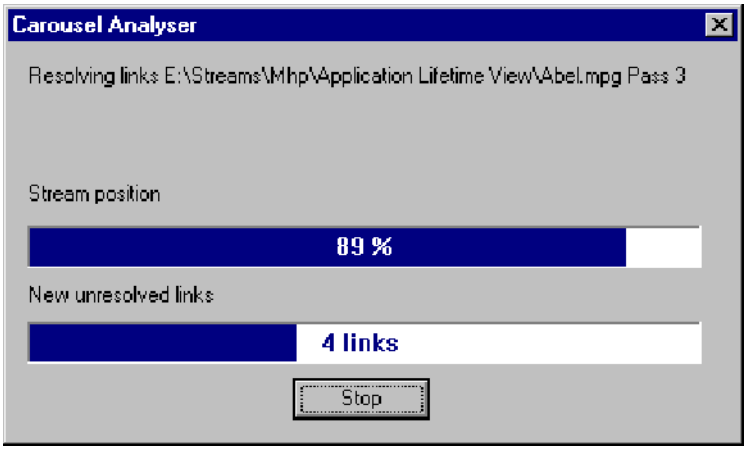
To open a file, select **File > Open...**. If the required file is in the list of recently analyzed files, then it can be opened from the list to save using the open file dialog box.



Alternatively, use the Ctrl+O keyboard shortcut.

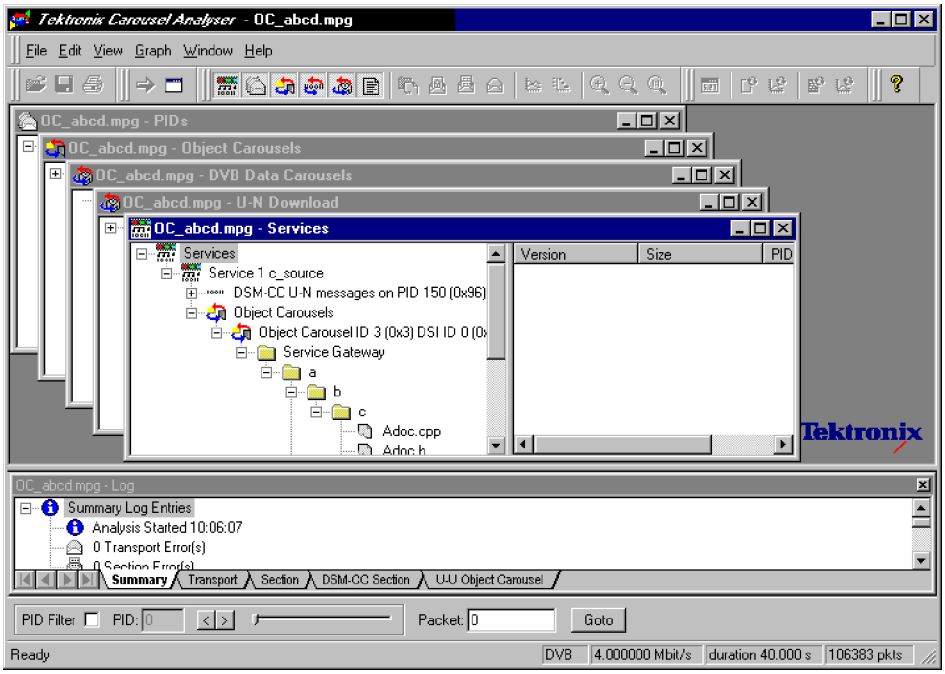
There is a shortcut button available on the Toolbar for opening a file, which uses the standard file open symbol:

As the file opens, a progress bar is displayed; analysis may require more than one pass through the transport stream file. The current pass number is shown in the title line. After the first pass, a second progress bar (new resolved links) shows the number of unresolved links at each pass.



Analysis can be halted at any time by selecting the **Stop** button in the dialog box; the stream is still opened, but only the elements that have been analyzed so far will be displayed.

By default, the Services window and the Log window open as soon as a stream file opens. Further windows can be opened by using the View Menu or the Toolbar. Note that although the options on the View menu remain the same, they are enabled or disabled according to which protocol element is highlighted at the time.



Menus and Controls

The following pages contain descriptions of the menu options, toolbar controls, status bars, and methods for managing the workspace.

Menu Options

The following pages describe all of the menu options. Since many of the options are context sensitive, they will be available only when their function is appropriate for the selected window or display element. When a menu option is not available, the option is grayed out.

File Menu Options. Table 6–4 shows the options available in the File menu.

Table 6-4: File menu options

Command	Function
Open...	Open an MPEG transport stream for analysis. The program opens the file selection dialogue box allowing the user to choose the required file.
Close	Closes the current file.
Save As...	Saves the file to a new file name.
Print	Opens the Print dialog.
Print Preview	Opens the Print Preview dialog.
Print Setup...	Opens the Print Setup dialog.
Exit	Closes any file that is open and terminates execution of the program.

Edit Menu Options. Table 6–5 shows the options available in the Edit menu.

Table 6-5: Edit menu options

Command	Function
Applications	Opens the Application Management dialog.
Go To Next	Jumps to next occurrence of the structure being viewed. The Packet field in the Transport Packet bar will reflect the change of packet.

View Menu Options. Table 6–6 shows the options available in the View menu.

***NOTE**. An active (depressed) button next to an option indicates that the window or toolbar is currently visible; an inactive button means that it is hidden.*

Table 6-6: View menu options

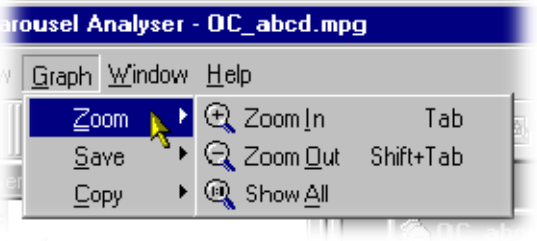
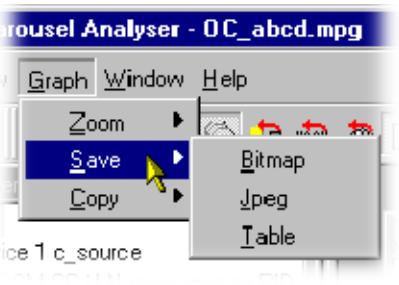
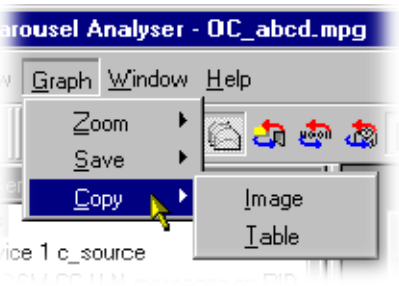
Command	Function
Toolbars >	Submenu shows or hides the toolbar.
Transport Packet Bar	Shows or hides the Transport Packet Bar.
Status Bar	Shows or hides the Status Bar.

The remaining options in this menu open and close the associated window. The options and windows are described elsewhere in this section.

- Program/Services, U-N Download, Object Carousels, Data Carousels, PIDs and Log.
- BIOP Message, U-N Message, Section, Transport Packet, Transport Packet List, Hex Dump, Timing, Carrier and Resources.
- Repitition and Bitrate.

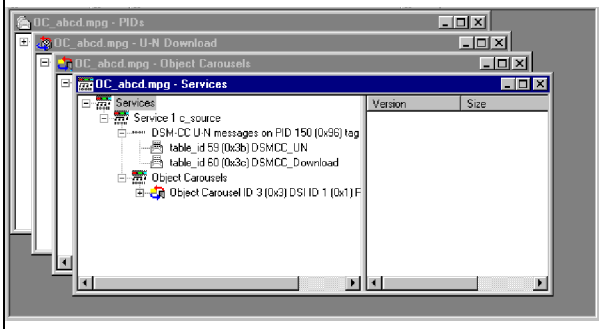
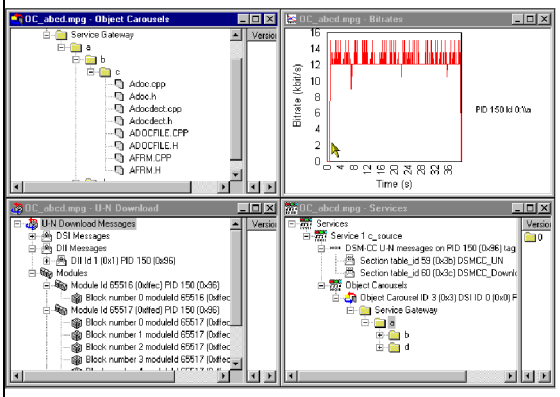
Graph Menu Options. Table 6–7 shows the options available in the Graph menu.

Table 6-7: Graph menu options

Command	Function
Zoom	Applies to Bitrate and Repetition views only.  **Zoom In**: Maximizes the central 50% (x-axis) of the current graph. **Zoom Out**: Takes one step back in the Zoom sequence. **Show All**: Resets the graph to show all points.
Save	Saves the graph in the selected format. 
Copy	Copies the graph to the clipboard in the selected format. 

Window Menu Options. Table 6–8 shows the options available in the Window menu.

Table 6-8: Window menu options

Command	Function
Cascade	Rearranges the windows like this: 
Tile	Tiles the windows. For example, four windows would be tiled like this: 
Arrange Icons	Aligns icons of any minimized windows at the bottom of the program's main window.
1 <<window title>> **2** <<window title>> **3**...etc	Makes the named window active, putting it on top of any windows that had been hiding all or part of it.

Help Menu Options. Table 6–9 shows the options available in the Help menu.

Table 6-9: Help menu options

Command	Function
Quick Help	Opens the Quick Help browser window.
About Carousel Analyzer	Opens a message box that displays the program version number and license number.

Toolbars

Quick access buttons are divided between several toolbars: File, Edit, View and Help.

A number of the toolbar functions are context-sensitive; which window is open and which element is highlighted will dictate which buttons are enabled and disabled.

File Toolbar

Open a file. This button is disabled when a file is open.

Save As… - BIOP file messages can be saved to separate files. Structures can also be saved to a separate file.

Print – only available for bit rate and repetition views.

Edit Toolbar

Jumps to next occurrence of the structure being viewed.

View Toolbar

The buttons in this toolbar open and close the associated windows. The windows are described elsewhere in this manual.

View Programs/Services

View PIDs

View Object Carousels

View Data Carousels

View U-N Download Messages

View Log

View BIOP Message

View U-N Message

View Section

View Transport Packet

View Bitrate

View Repetition Rate

View Lifetime

Zoom In

Zoom Out

Show All

Timing Toolbar

Edit Application Timing

View Entity Cycle Time

View Entity Cycle Time Graph

View Carousel Cycle Time

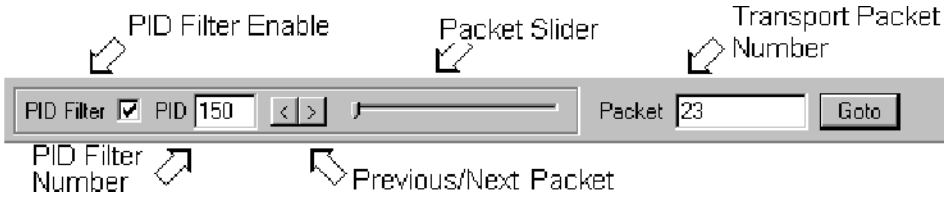
View Carousel Cycle Time Graph

Help Toolbar

About Carousel Analyzer: Opens a dialog box which displays the program version number and license number. This information will be required if a Technical Support is contacted.

Transport Packet Bar

The Transport Packet bar provides a quick method of locating and navigating to transport packets PIDs.



Packet: To locate a particular Transport Packet, enter the Transport Packet number and select Goto.

PID Filter enable: The PID navigation feature can be enabled by selecting the checkbox (as shown).

To navigate to a specific packet: with the PID Filter disabled, enter the packet number and select either the Previous or Next Packet button. If a PID structure view is now requested from a View, the search for the PID will commence with the transport packet number displayed.

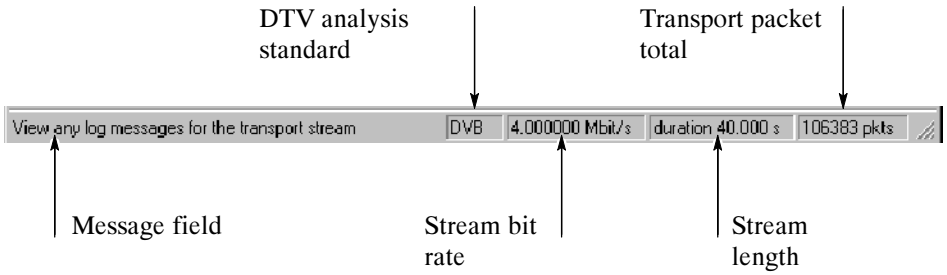
Similarly, with the PID Filter enabled, each press of either the Previous/Next button will display the previous/next transport packet containing the PID number displayed in the PID Number field. If a PID structure view is now requested from a View, the search for the PID will commence with the transport packet number displayed.

***NOTE**. When a Transport Packet is viewed, the number in the Packet field will increment by one.*

The Transport Packet bar can be hidden from view by using the View menu Toolbars option.

Status Bar

The Status bar provides information about the stream that is currently being displayed. A message field gives a description of the button, menu or option that the cursor is resting on; other non-critical messages may also be shown.

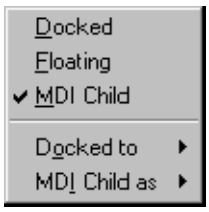


Workspace

Window Management

In addition to the generic Cascade and Tile options available from the window menu, management of individual windows is provided through a submenu available by right-clicking the title bar of the individual window.

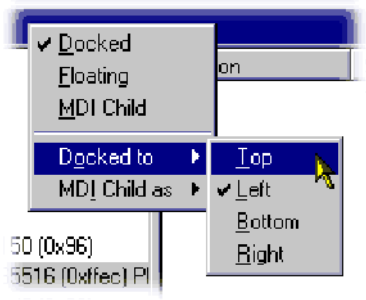
Right-click window title bar:



Each window within the workspace can be designated as Docked, Floating, or as an MDI Child.

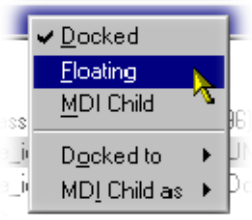
Docked. When docked, a window will be automatically placed against one of the four sides of the workspace.

For example, selecting **Docked > Top** will dock the selected window at the top of the workspace.



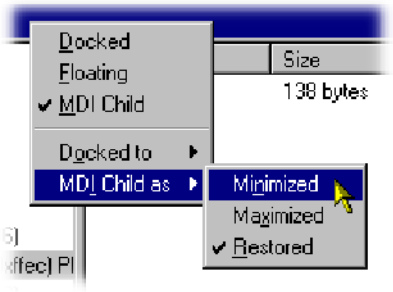
Floating. Designating a window as floating allows it to be moved around on the monitor desktop independently of the Carousel Analyzer interface.

For example, selecting Floating will allow the window to be moved anywhere on the desktop:



MDI Child. Designating a window as an MDI Child allows it to be moved anywhere within the workspace.

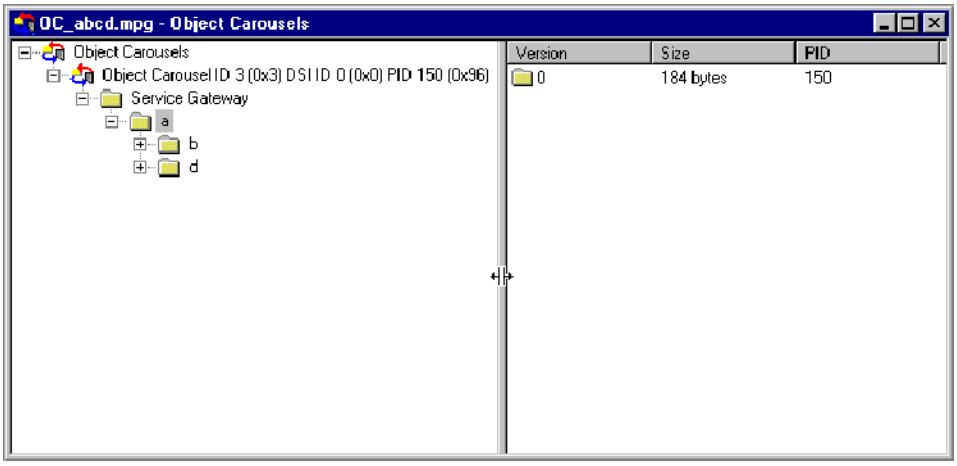
The MDI Child submenu allows the window to be designated as Restored, Minimized or Maximized.



***NOTE**. When a window is "docked" it can be dragged (and dropped) around the workspace; when it is at an edge it will adopt a docked position. MDI Children do not attempt to dock with the edges of the workspace.*

Version/Size Pane Display

Most of the views described later use a split-pane arrangement to display the view data and related version, file size and PID information. The information is displayed in the right pane. However, the default arrangement when opening the view is that the right pane is closed. To open the pane, pass the cursor over the right edge of the view until it changes to the split pane cursor, then move the dividing bar to the desired position.



Content Management

The principles employed in displaying the information in each workspace window are applicable to all windows, although the content will vary from window to window.

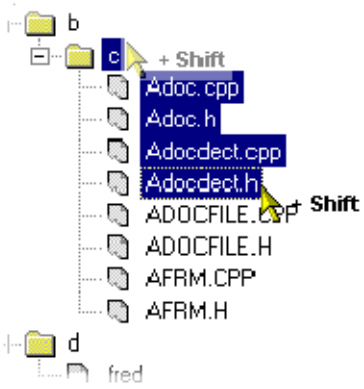
Tree Structure. Structures are represented by tree diagrams, with the “root node” or highest level component at the top. Components that contain more information underneath them in the structure are indicated by a + box. Clicking on the + box will display the structure underneath the node. Similarly, if a - box is adjacent to the node, the level of detail immediately below it is already displayed; this detail can be hidden by clicking on the - box. Components that are connected to a branch of the tree without a square box are leaf nodes; they display the lowest and finest level of detail.

Right-clicking on a tree node may open a context sensitive menu.

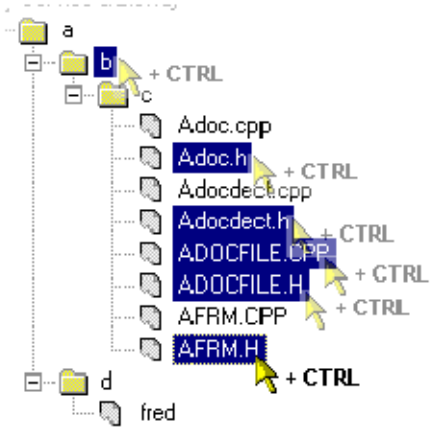
Component Selection. Components can be selected (or highlighted) either singly or in groups. When selected, the views available from the View menu (or a right-click menu) will be those that can be applied to all of the selected components.

Single component selection
Selected by clicking on a component.

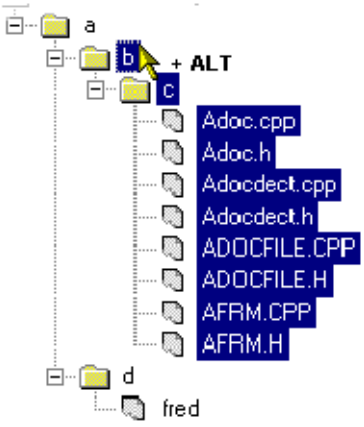
Range selection
Selected by highlighting the first component in the required selection and, while holding the Shift key on the keyboard, clicking on the last component. The selected range will be highlighted.



Multiple component selection
Selected by holding the Control key (CTRL) on the keyboard and clicking the required components.



Node selection
Selected by holding the Alt key on the keyboard and clicking the required node; all subcomponents will be selected.



Saving Components. Selected (or highlighted) components can be saved through the right-click menu. However, the manner in which the components were selected (see previous paragraphs) will affect the file structure of the saved components.

If a Node Selection has been made, the directory structure is recreated at the specified location and the subcomponents are saved to their equivalent directories.

If a Range or Multiple selection has been made, all files will be duplicated in the root directory at the specified location in addition to recreating the directory structure and saving the sub-components to their equivalent directories.

Hex Displays. Hex displays follow a common format.

The eight-digit number in the left column is the address of the first (that is, left) byte in the row. The addresses themselves are shown in hexadecimal format.

The center column displays the contents of the structure in hex format.

The right column displays the contents of the structure in ASCII format.

Views

The Carousel Analyzer provides three types of view as a means of inspecting and analyzing information carried in a transport stream.

Static Views:
(Programs/Services, Object Carousel, U-N Download, Data Carousel, PID, Log)
Static views display information derived from the transport stream when it is opened.

Structure Views:
(Transport Packet, U-N Messages, Module, Section, BIOP Messages)
Structure views use Tektronix scripting technology to analyze structures that appear in the transport stream, for example, tp, and BIOP messages. For repeated structures, this view allows all occurrences to be visited.

Chart Views:
(Bitrate, Repetition Rate)
Chart views present timing information in graphical form about one or more structure in the stream.

View	Page	View	Page
Programs/Services View	6-30	Structure Views	6-52
Object Carousel View	6-34	Bitrate View	6-55
U-N-Download View	6-41	Repetition View	6-58
Data Carousel (DVB) View	6-45	PID View	6-61
Data Carousel (ARIB) View	6-46	Log View	6-64
Resource View	6-50	Cycle Times View	6-67

In the following sections, each view is described together with the information accessible from that view.

The nodes displayed in the views relate to the protocol layers as shown in the diagram below:

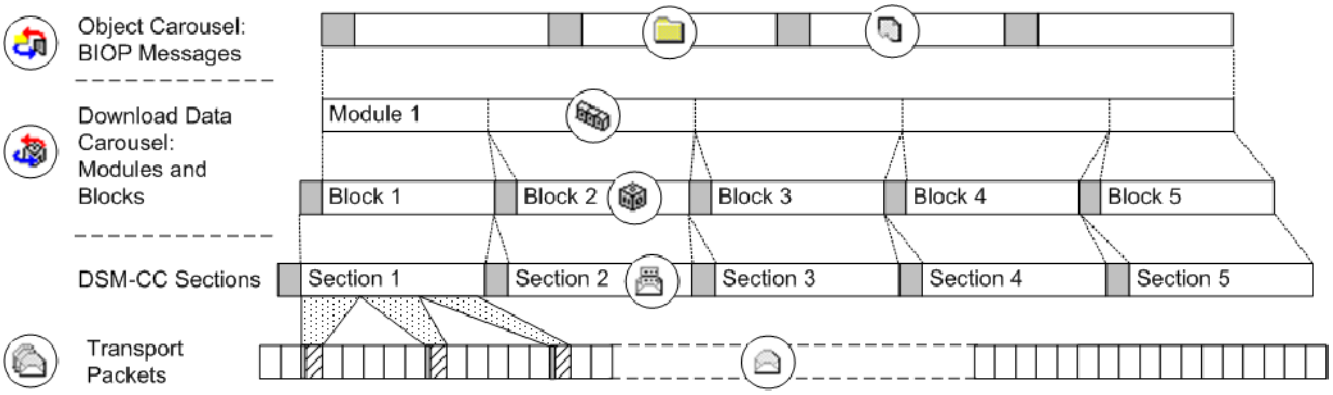


Table 6-10: Key to Tree Nodes

	Service/Program		Active PIDs/PIDs
	Download Block		BIOP Object Directory / ARIB Directory
	U-N Message		BIOP Object / ARIB Resource
	Download Module		Table
	Compressed Download Module		Transport Packet
	Data Carousel		Audio Stream
	Object Carousel		Video Stream
	Stream Object		Data/Other Stream
	Stream Event Object		MHP Applications
	Java Application		HTML Application

Key to Node Overlays. Overlays are used to signify additional information about nodes; the overlays may be used individually or in combination.

	Absent Objects: Objects referenced but not found, for example, directory object not found. The path in which the absent object is recognized is also marked.
	Unresolved Objects: When an object is found during analysis, but its key is not referred to in the Service Gateway, it is displayed under an Unresolved Objects node.
	Boot Class Objects: Boot class items are identified. The path in which the boot class resides is also indicated.
	Manual Signaling: Indicates that a PID has been subjected to the manual signaling process; used in the carousel and PID views only.

Programs/Services View

Menu Bar: View > Program/Services **Toolbar**:

The Programs/Services view gives a static, DVB/ARIB service (or MPEG program) centric view of the transporst stream contents. Each program is listed together with the service name (for DVB/ARIB). Expanding a program item will reveal its elemental PIDs and any object (or data) carousels associated with it.

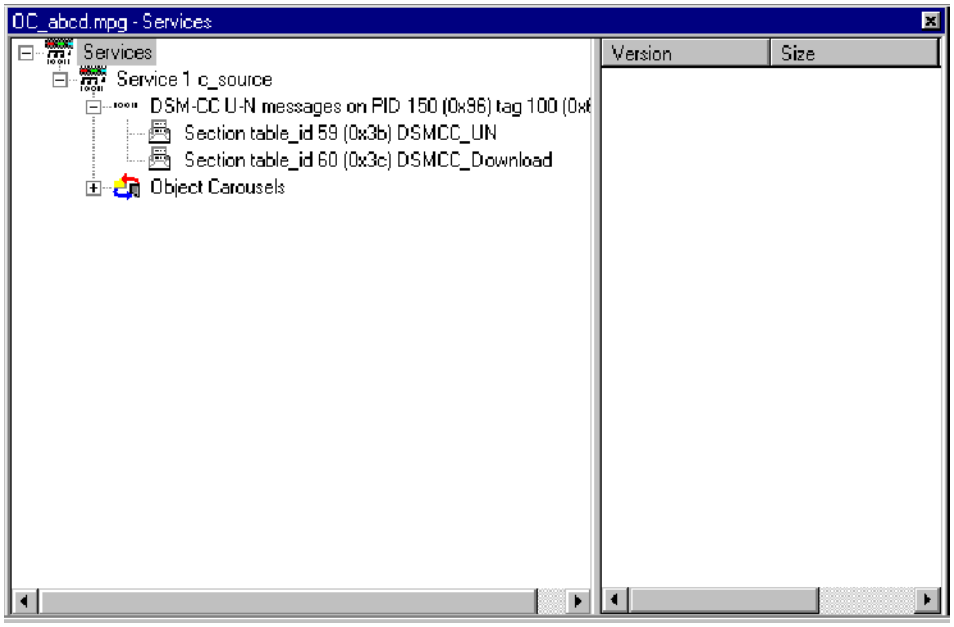


Figure 6- 2: DVB Programs/Services view (typical)

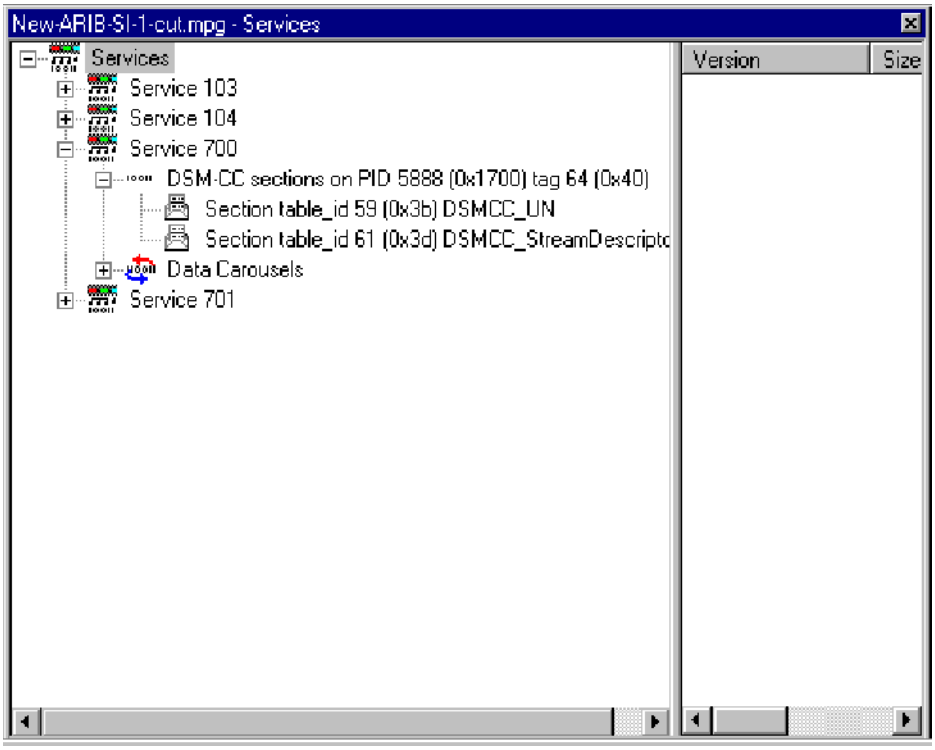
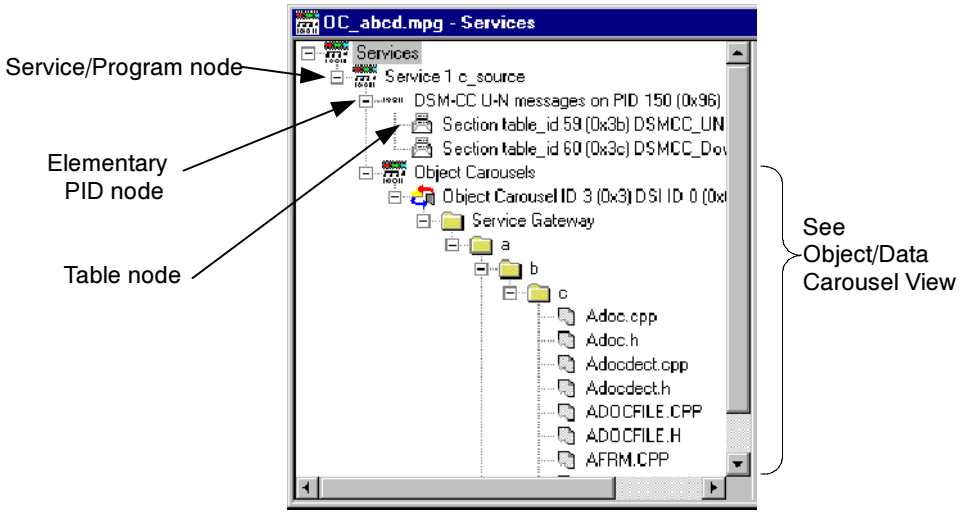


Figure 6-3: ARIB Programs/Services view (typical)

The diagram below indicates the primary nodes that are accessible from the Program/Services view.



Service/Program Node

This node represents a specific program or service (DVB or ARIB) in a transport stream. If a name for the program is available in the SDT (Service Description Table), it is displayed. Each Elementary PID listed in the PMT (Program Map Table) will have a corresponding node displayed as a child node of the Services/Program node. Similarly, any Object or Data Carousels associated with the Services/Program node are listed as child nodes.

Right-Click Menu Options.

View PMT — Opens the Section Table view for the PMT.

View Bitrate — Activates or creates a bit rate view of the sum of the elementary streams that are listed in the PMT for this program.

Elementary PID Node

This node represents a PID referenced by a program. If the PID carries Sections, these are represented as Table nodes.

Right-Click Menu Options.

View Transport Packet — Displays a structure view of the next transport packet encountered on this PID from the current stream position (as indicated by the Transport Packet number that is displayed in the Transport Packet Bar).

View Cycle Time ▶ — Allows either cycle time statistics or graphical view to be selected.

View Repetition — Activates or creates a view of the repetition rate of this PID in the transport stream.

View Bitrate — Activates or creates a bit rate view of this PID.

Table Node

This node represents the stream of sections present on a specific PID with a specific table identity.

Right-Click Menu Options.

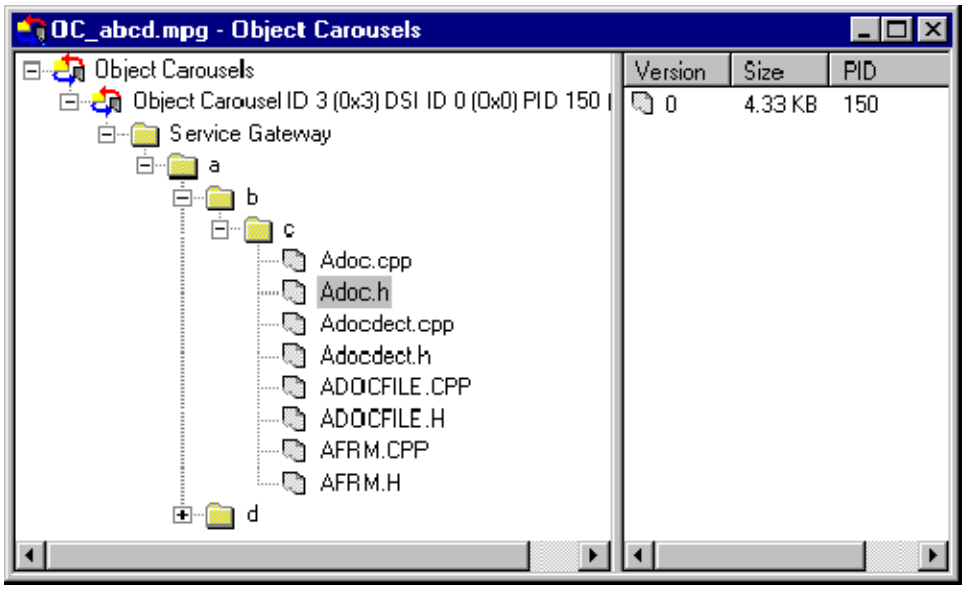
View Section	Displays a structure view of the next section with this PID and table identity that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).
View Cycle Time ▶	Allows either cycle time statistics or graphical view to be selected.
View Repetition	Activates or creates a view of the repetition rate of this PID with this PID and table identity.
View Bitrate	Activates or creates a bit rate view of sections with this PID and table identity.

Object Carousel View

Menu Bar: View > Object Carousels **Toolbar**:

The Object Carousel view shows a static view of every object carousel in the transport stream.

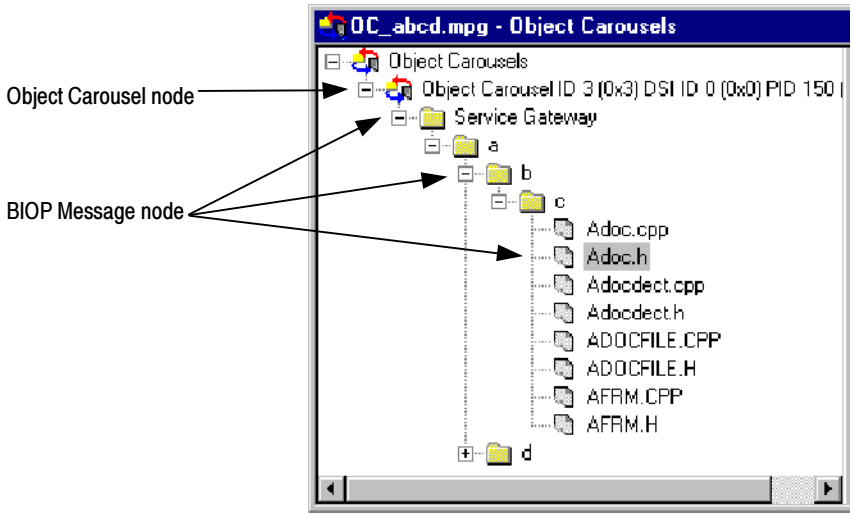
The view is in the style of Windows Explorer. The left pane shows the directory structure of the object carousels, and the right pane lists the versions of the BIOP message currently selected in the left pane.



Double-clicking a file BIOP message can bring up an appropriate viewer application if the operating system can find one (file associations can be set through the Windows Explorer Options). File BIOP messages can also be saved to disk by selecting **File > Save As...**.

NOTE. *The version number of the BIOP messages represents the version number of the module that carries the BIOP message.*

The following diagram indicates the nodes accessible from the Object Carousels view:



Object Carousel node This node indicates that an object carousel has been signaled in the PSI/SI.

Right-Click Menu Options.

View Application Timing
Opens the Application Management dialog.

View DSI Carrying Carousel IOR
Displays a structure view showing the U-N DSI message that carries the service gateway IOR for this carousel.

BIOP Message node This node represents a specific BIOP Message. If the node represents a BIOP directory, the directory entries appear as child nodes.

Right-Click Menu Options.

Open	View the message in its native format. This only works for file messages that have an associated viewer application on the PC.
Save As…	Save the BIOP message to a separate file.
View BIOP Message	Displays a structure view of the next appearance of this BIOP message that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

View Carrier Module Activates or creates the U-N download view and highlights the module that carries this BIOP message.

View Cycle Time ▶ Allows either cycle time statistics or graphical view of the carousel to be selected.

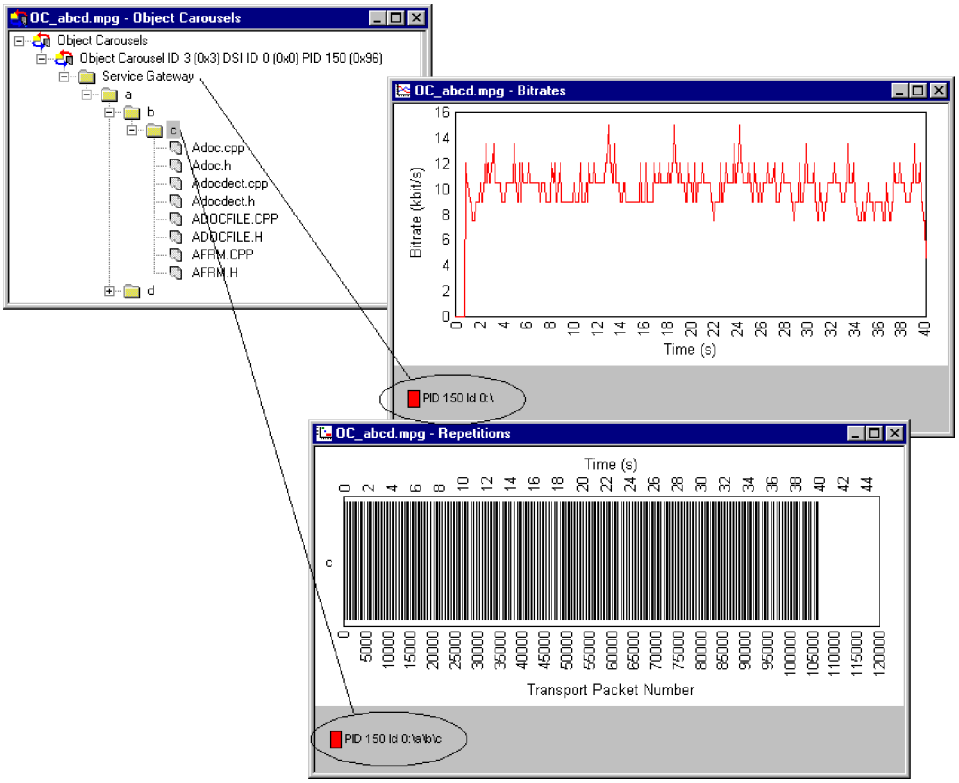
View Repetition Activates or creates a view of the repetition of this BIOP message.

View Bitrate

> This BIOP message: Activates or creates a view of the bit rate of this BIOP message.

> Including nested messages: View the sum of the bit rates for this BIOP message and all descendant messages (that is, all children and their children). These options are only available for BIOP directory messages.

***NOTE**. If a Service Gateway is viewed in the Bitrate, Repetition, or Structure view, its name in these views reflects the DSI transaction ID and PID in which it was carried.*

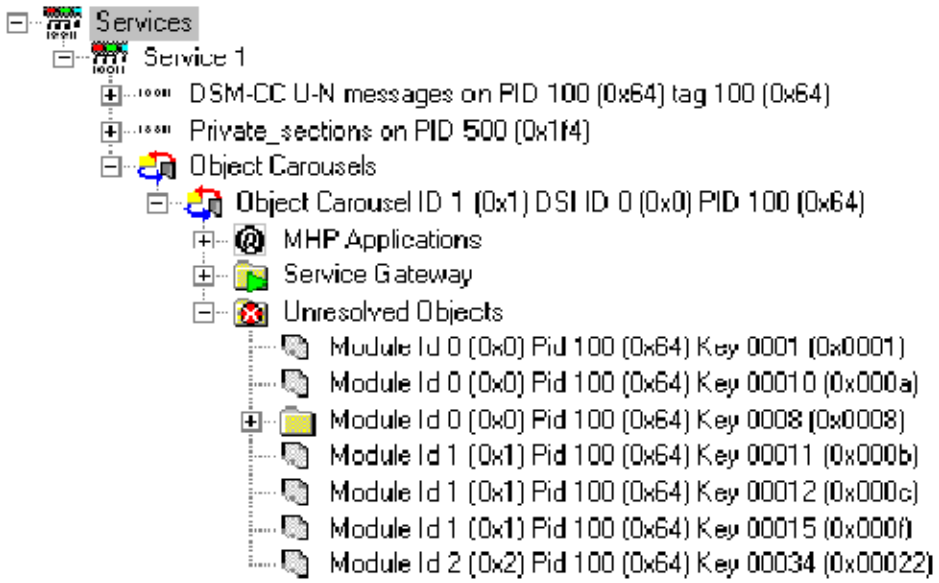


MHP Applications

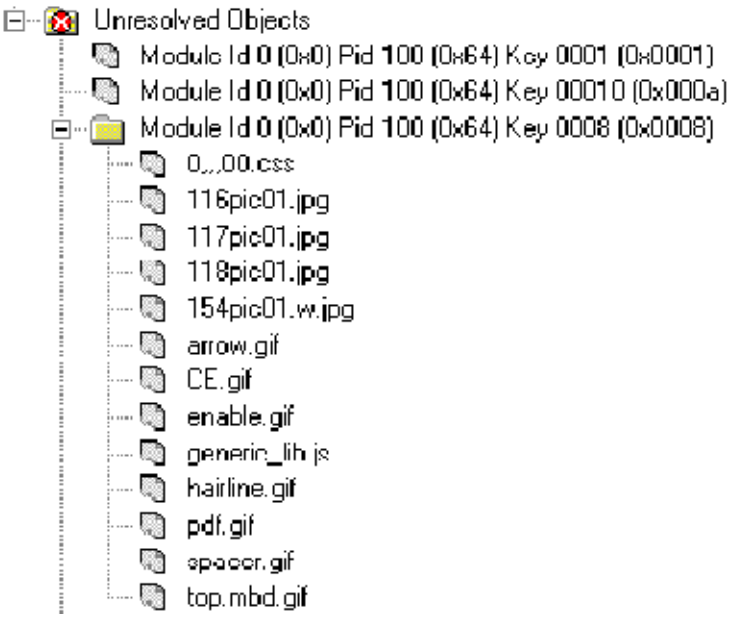
(See *MHP Support*, page 6-91.)

Unresolved Objects

When an object is found during analysis, but its key is not referred to in the Service Gateway, it is displayed under an Unresolved Objects node.

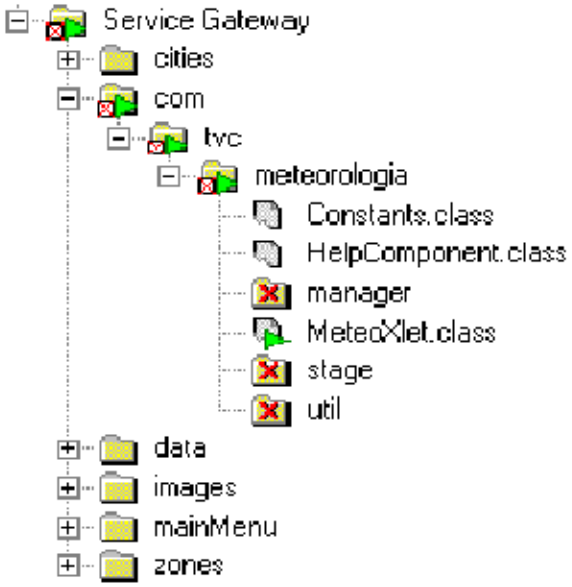

Services
Service 1
DSM-CC U-N messages on PID 100 (0x64) tag 100 (0x64)
Private_sections on PID 500 (0x1f4)
Object Carousels
Object Carousel ID 1 (0x1) DSI ID 0 (0x0) PID 100 (0x64)
MHP Applications
Service Gateway
Unresolved Objects
Module Id 0 (0x0) Pid 100 (0x64) Key 0001 (0x0001)
Module Id 0 (0x0) Pid 100 (0x64) Key 00010 (0x000a)
Module Id 0 (0x0) Pid 100 (0x64) Key 0008 (0x0008)
Module Id 1 (0x1) Pid 100 (0x64) Key 00011 (0x000b)
Module Id 1 (0x1) Pid 100 (0x64) Key 00012 (0x000c)
Module Id 1 (0x1) Pid 100 (0x64) Key 00015 (0x000f)
Module Id 2 (0x2) Pid 100 (0x64) Key 00034 (0x00022)

However, when a directory object is found, the keys of its child nodes can be resolved and its tree structure built correctly, even though the directory object itself may still be unresolved.



Absent Objects

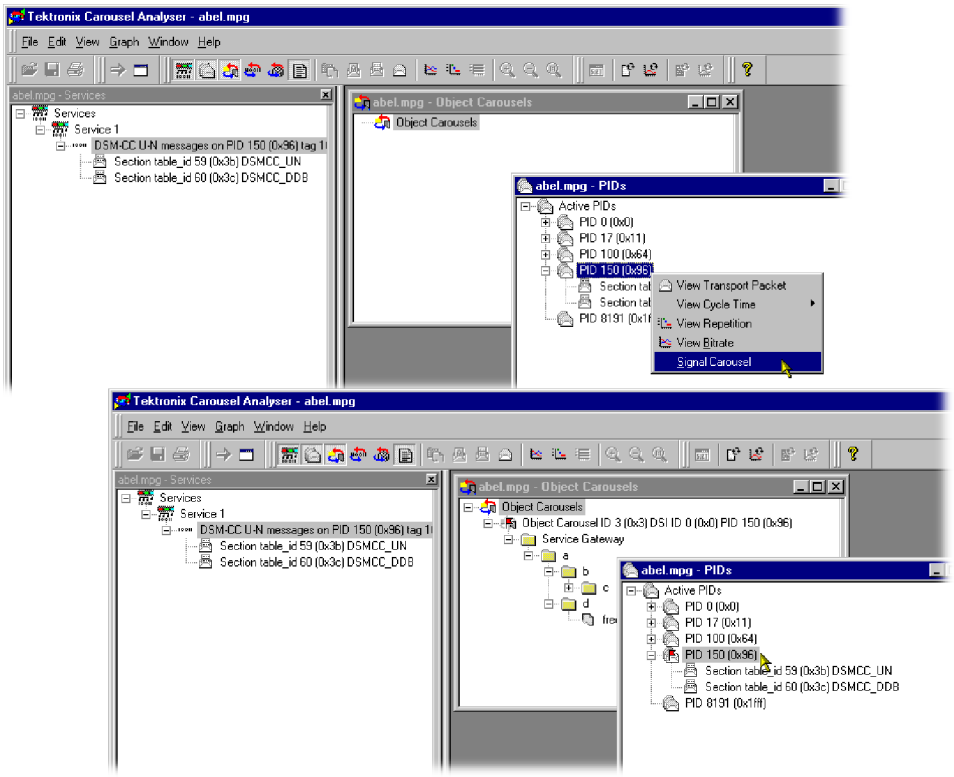
Objects referenced but not found are identified, for example, - directory object not found. The path in which the absent object is recognized is also marked ( ).



Manual Signaling

If a carousel is present in a stream, but has not been found during analysis, it can be identified with Manual Signaling from the related PID node.

The Signal Carousel command can be found on the right-click menu associated with each PID node. When this command is selected, the stream will be reprocessed. During processing, only the DSM-CC tables on the selected PID will be analyzed.



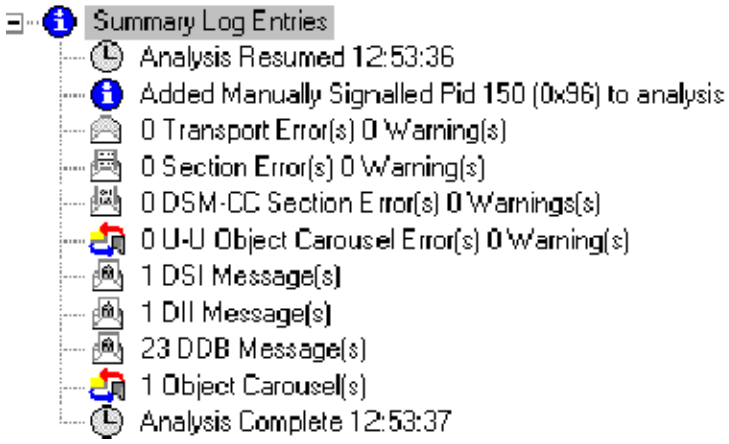
The user interface is updated when the stream has been processed. Any carousels that have been identified are added to the Carousel view. The signal icon, used inly in the carousel and PID views, indicates that the PID has been subjected to the manual signaling process.

The PID view will display a list of the table types that were detected during processing.

***NOTE**. Carousels that span multiple PIDs will be only partially analyzed. The PID must contain a Service Gateway for any Object Carousel view to be displayed.*

The Log view is refreshed by describing the most recent action, for example, **Added Manually Signalled PID150**….

Any feedback from the Manual Signaling will be displayed in the Summary log.

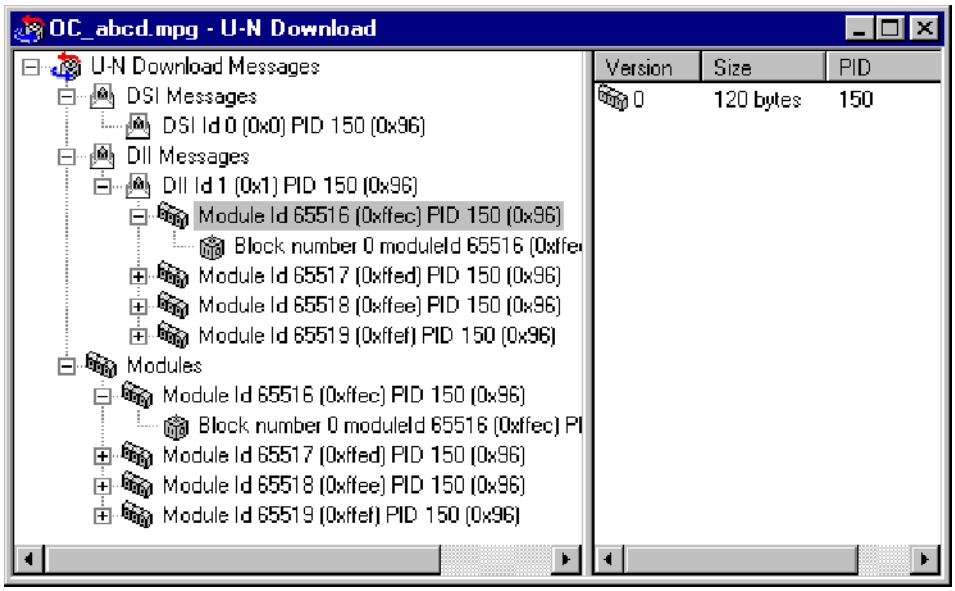

Summary Log Entries
Analysis Resumed 12:53:36
Added Manually Signalled Pid 150 (0x96) to analysis
0 Transport Error(s) 0 Warning(s)
0 Section Error(s) 0 Warning(s)
0 DSM-CC Section Error(s) 0 Warnings(s)
0 U-U Object Carousel Error(s) 0 Warning(s)
1 DSI Message(s)
1 DII Message(s)
23 DDB Message(s)
1 Object Carousel(s)
Analysis Complete 12:53:37

U-N-Download View

Menu Bar: View > U-N-Download **Toolbar**:

This static view shows all the U-N-download (DSM-CC data carousel scenario) messages in the transport stream.

The view is in the style of Windows Explorer. The left pane contains a hierarchical pane on the left and a version pane on the right. The version pane will list the versions of the U-N download message selected in the left pane.

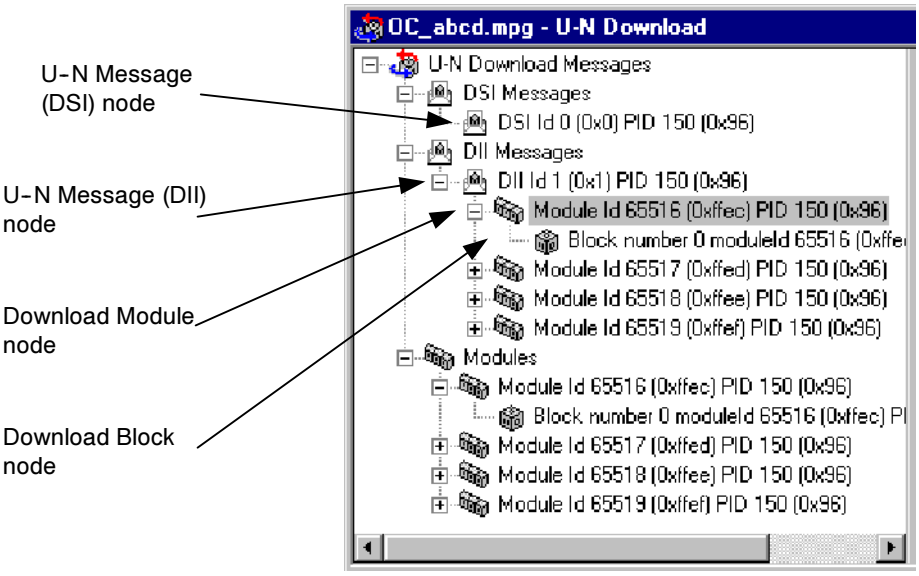

OC_abcd.mpg - U-N Download
U-N Download Messages
DSI Messages
DSI Id 0 (0x0) PID 150 (0x96)
DII Messages
DII Id 1 (0x1) PID 150 (0x96)
Module Id 65516 (0xffec) PID 150 (0x96)
Block number 0 moduleId 65516 (0xffe
Module Id 65517 (0xffed) PID 150 (0x96)
Module Id 65518 (0xffee) PID 150 (0x96)
Module Id 65519 (0xffef) PID 150 (0x96)
Modules
Module Id 65516 (0xffec) PID 150 (0x96)
Block number 0 moduleId 65516 (0xffec) PI
Module Id 65517 (0xffed) PID 150 (0x96)
Module Id 65518 (0xffee) PID 150 (0x96)
Module Id 65519 (0xffef) PID 150 (0x96)
Version
Size
PID
0
120 bytes
150

DII items contain module items that the DII message references. All modules are also listed under the “Modules” item.

Modules may be in compressed form; the version of the compressed icon is displayed in the Version column of the right pane.

Modules are listed independently of DII messages in case the DII does not reference the module correctly; for a compliant stream, each module is listed as a child of the DII node and within the Modules node.

The following illustration indicates the nodes that are accessible from the U-N Download view.


U-N Message (DSI) node
U-N Message (DII) node
Download Module node
Download Block node
OC_abcd.mpg - U-N Download
U-N Download Messages
DSI Messages
DSI Id 0 (0x0) PID 150 (0x96)
DII Messages
DII Id 1 (0x1) PID 150 (0x96)
Module Id 65516 (0xffec) PID 150 (0x96)
Block number 0 moduleId 65516 (0xffe
Module Id 65517 (0xffed) PID 150 (0x96)
Module Id 65518 (0xffee) PID 150 (0x96)
Module Id 65519 (0xffef) PID 150 (0x96)
Modules
Module Id 65516 (0xffec) PID 150 (0x96)
Block number 0 moduleId 65516 (0xffec) PI
Module Id 65517 (0xffed) PID 150 (0x96)
Module Id 65518 (0xffee) PID 150 (0x96)
Module Id 65519 (0xffef) PID 150 (0x96)

U-N Message (DSI) node

This node represents a Download Server Initiate message.

Right-Click Menu Options.

View U-N Message — Displays a structure view of the next appearance of this DSI message that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).

View Carrier Section — Displays a structure view of the next appearance of the section that carries this DSI message.

View Cycle Time > — Allows either cycle time statistics or graphical view of the object to be selected.

View Repetition — Activates or creates a repetition view of the DSI message.

View Bitrate — Activates or creates a bit rate view of the DSI message.

U-N Message (DII) node

This node represents a Download Information Indication message. A DII message may reference modules. If the module reference can be resolved, the DII tree node will contain child Module nodes.

Right-Click Menu Options.

View U-N Message	Displays a structure view of the next appearance of this DII message that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).
View Carrier Section	Displays a structure view of the next appearance of the section that carries this DII message.
View Cycle Time >	Allows either cycle time statistics or graphical view of the object to be selected.
View Repetition	Activates or creates a repetition view of the DII message.
View Bitrate	Activates or creates a bit rate view of the DII message.

Download Module node

This node represents a U-N Download Module. The download blocks that constitute the module are listed as child nodes.

Right-Click Menu Options.

View Hex Dump	Displays a data view of the next appearance of this module that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).
View Cycle Time >	Allows either cycle time statistics or graphical view of the object to be selected.
View Repetition	Activates or creates a repetition view of the module.
View Bitrate	Activates or creates a bit rate view of the module.

Block node This node represents a U-N Download Data Block (DDB).

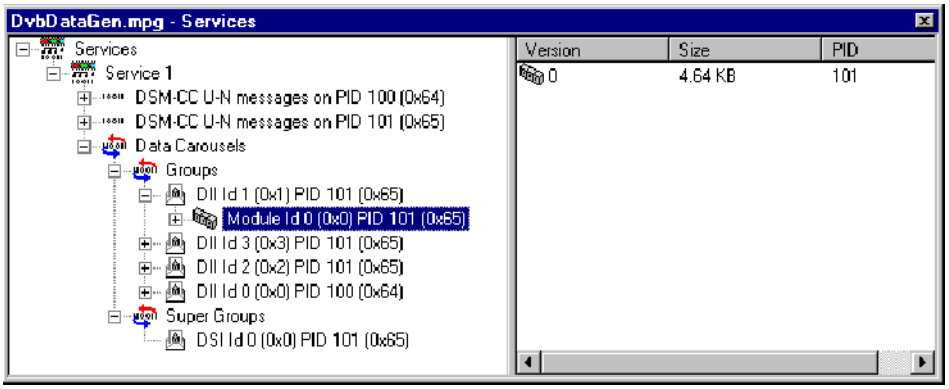
Right-Click Menu Options.

View U-N Message	Displays a structure view of the next appearance of this DDB message that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).
View Carrier Section	Displays a structure view of the next appearance of the section that carries this DDB message.
View Cycle Time >	Allows either cycle time statistics or graphical view of the object to be selected.
View Repetition	Activates or creates a repetition view of the DDB message.
View Bitrate	Activates or creates a bit rate view of the DDB message.

Data Carousel (DVB) View

Menu Bar: View > Data Carousel **Toolbar**:

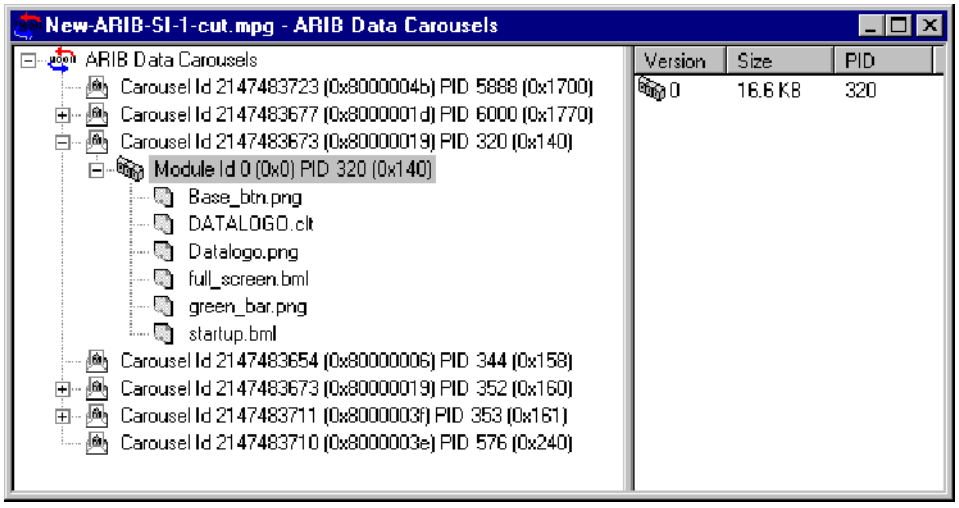
This static view shows all the data carousels in the DVB transport stream. The view is in the explorer style with a hierarchical view in the left pane and a version view in the right.



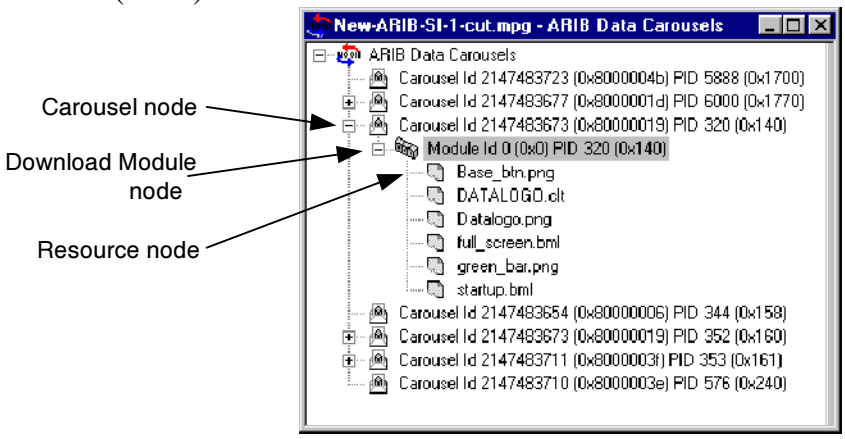
Data Carousel (ARIB) View

Menu Bar: View > Data Carousel **Toolbar**:

This static view shows all the data carousels in the ARIB transport stream. The view is in the explorer style with a hierarchical view in the left pane and a version view in the right.



The diagram below indicates the nodes that are accessible from the Data Carousel (ARIB) view.


Carousel node
Download Module node
Resource node
New-ARIB-SI-1-cut.mpg - ARIB Data Carousels
ARIB Data Carousels
Carousel Id 2147483723 (0x8000004b) PID 5888 (0x1700)
Carousel Id 2147483677 (0x8000001d) PID 6000 (0x1770)
Carousel Id 2147483673 (0x80000019) PID 320 (0x140)
Module Id 0 (0x0) PID 320 (0x140)
Base_btn.png
DATALOGO.clt
Datalogo.png
full_screen.bml
green_bar.png
startup.bml
Carousel Id 2147483654 (0x80000006) PID 344 (0x158)
Carousel Id 2147483673 (0x80000019) PID 352 (0x160)
Carousel Id 2147483711 (0x8000003f) PID 353 (0x161)
Carousel Id 2147483710 (0x8000003e) PID 576 (0x240)

Carousel node

This node represents a single Data Carousel in the ARIB data carousel structure.

Right-Click Menu Options.

View U-N Message	Displays a structure view of the next appearance of this DII message that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).
View Carrier Section	Displays a structure view of the next appearance of the section that carries this DII message.
View Cycle Time >	Allows either cycle time statistics or graphical view of the object to be selected.
View Repetition	Activates or creates a repetition view of the DII message.
View Bitrate	Activates or creates a bit rate view of the DII message.

Download Module node

This node contains all of the resources available to a module.

Right-Click Menu Options.

View Resources	Displays the Resource view of the selected module.
Save Resources	Saves the resource files to a selected location. The header information is not saved.
View Cycle Time >	Allows either cycle time statistics or graphical view of the object to be selected.
View Repetition	Activates or creates a repetition view of the module.
View Bitrate	Activates or creates a bit rate view of the module.

(See also *ARIB Module Versions*, page 6-49.)

Resource node Each Resource node is a leaf node containing one resource file.

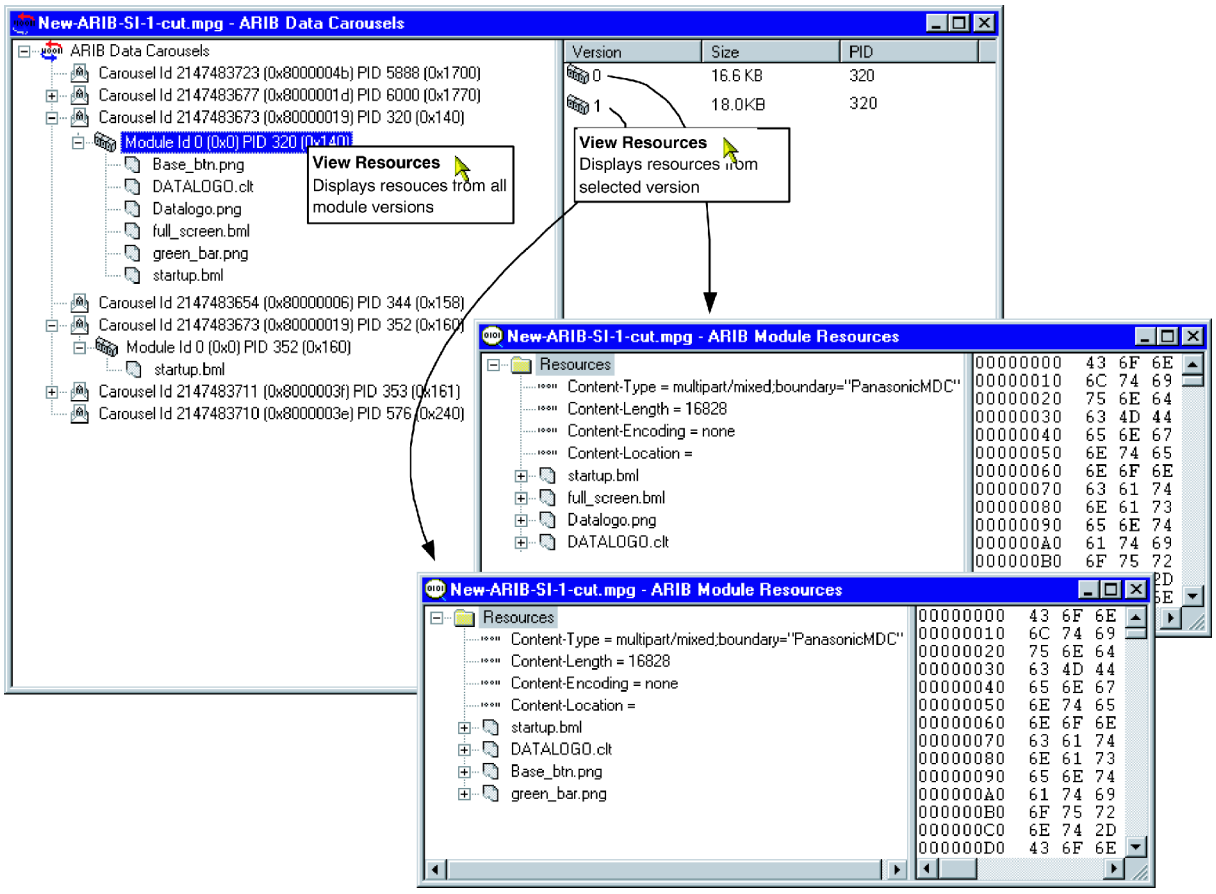
Right-Click Menu Options.

Open	Opens the resource in an associated application to allow it to be viewed. If no association has been made with the file type on the host computer, a message is displayed.
Save	Saves the resource file to a selected location. The header information is not saved.
View	Displays the Resource view. The selected resource is highlighted in the Resource view.

ARIB Module Versions

Note that there may be multiple versions of a single ARIB module. Each version of the same module can potentially contain different resources. For example, Version 1 may contain resources A, B, and C and Version 2 may contain resources C, D, and E.

When viewing the resources in Data Carousel and Service/Program views, the resources listed under the Module node will be all resources across all versions, for example, A, B, C, D and E. When opening or saving any of these resources from Data Carousel or Service/Program views, the operation will work on the first version encountered in the stream (A, B, and C will come from Version 1 and D and E will come from Version 2). Basically, these two views contain a summary of all the resources encountered in that module regardless of version.

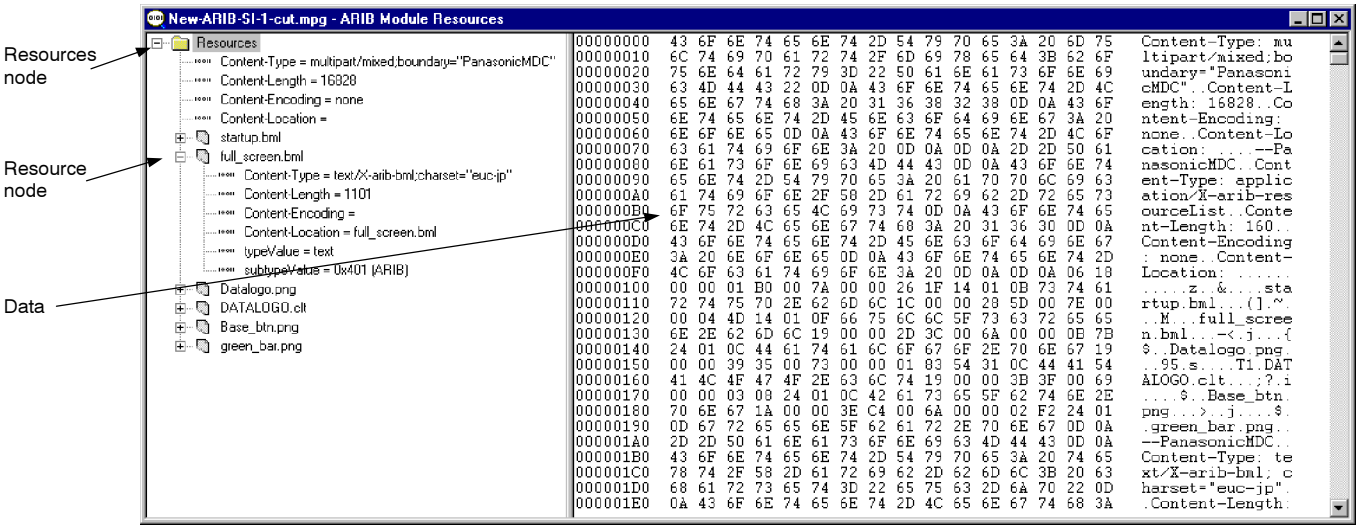


The ARIB Resource view will show only the resources contained in an individual module version - to view resources from different module versions, the user must use the **Go To Next** command or open a different version in ARIB Resource view.

Resource View

Menu Bar: View > Resources

The ARIB Resources view displays a hierarchical and raw data interpretation of the resource structure in Data Carousels. The raw data is presented in hexadecimal and ASCII form in the adjacent pane.



Resources node This Resources node displays a header and the resources associated with one Module.

Right-Click Menu Options.

Go To Next Displays the next occurrence of the Resource node in the transport stream (note the change of **Packet** number in the Status bar).

Save Saves the resource files to a selected location. The header information is not saved.

Resource node Each Resource node displays header information and a resource.

Right-Click Menu Options.

Open Opens the resource in an associated application to allow it to be viewed. If no association has been made with the file type on the host computer, a message is displayed.

Save Saves the resource file to a selected location. The header information is not saved.

Data Represents the currently selected tree node.

Right-Click Menu Options.

Save As… Saves the Module Resource data to a selected location.

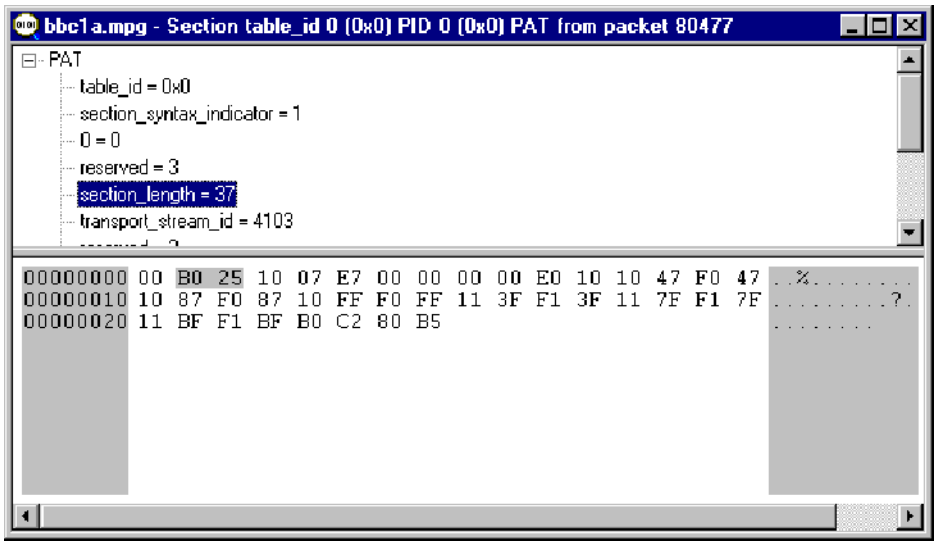
Go To Next Displays the next occurrence of the Resource node in the transport stream (Note the change of **Packet** number in the Status bar).

View Transport Packet List

Displays the **Transport Packet Contributions** view which lists the transport packets that have contributed to the resources in the module (See *Structure Views*, page 6–52).

Structure Views

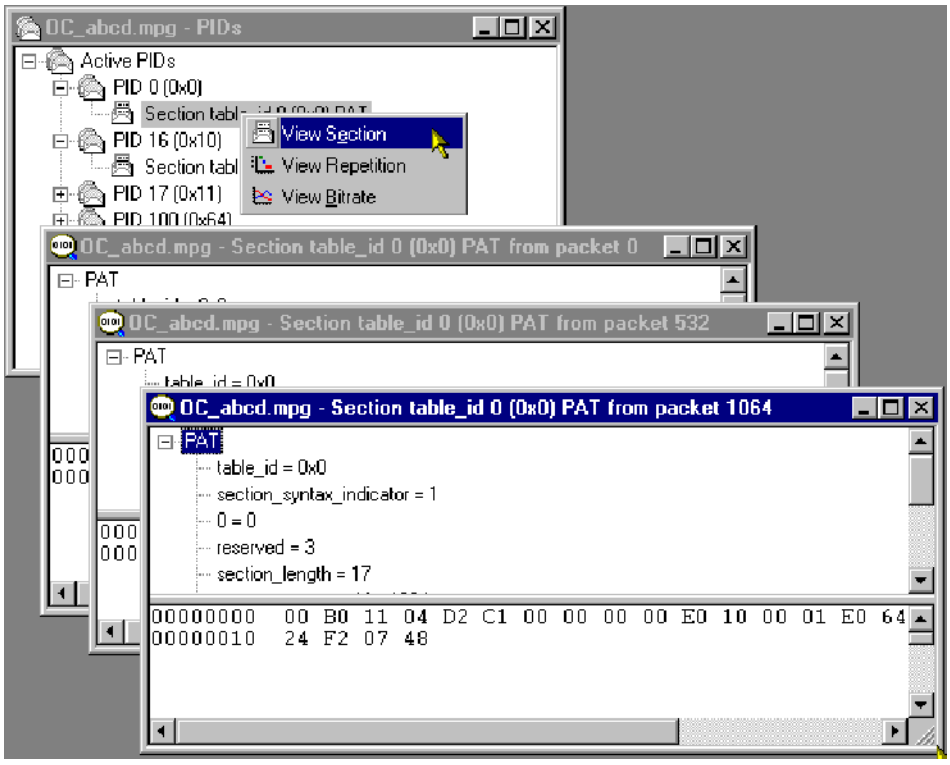
Structure views display a hierarchical and raw data interpretation of a structure (BIOP Message, U-N Message, Module, Section, or Transport Packet). The hierarchical view is based on a script from the script files that are loaded (see *Script Selection and Manipulation*, page 6-6). Raw data is presented in hexadecimal and ASCII format in the lower pane.


bbc1a.mpg - Section table_id 0 (0x0) PID 0 (0x0) PAT from packet 80477
PAT
table_id = 0x0
section_syntax_indicator = 1
0 = 0
reserved = 3
section_length = 37
transport_stream_id = 4103
00000000 00 B0 25 10 07 E7 00 00 00 00 E0 10 10 47 F0 47 ..%.........G.
00000010 10 87 F0 87 10 FF F0 FF 11 3F F1 3F 11 7F F1 7F ....?.?....
00000020 11 BF F1 BF B0 C2 80 B5 ....

Highlighting an element in the table window will automatically highlight the section of the hexadecimal code that contains the selected information.

The view will bring up the first appearance of a particular message in the transport stream reading from the current packet position. To view the next appearance, select **Edit > Go to Next**. This will display the next repetition of the message in the open structure view window; if necessary, it will wrap to the first occurrence.

For example, in the screenshot below, the PAT first appears in transport packet 0. Selecting **Go to Next** and viewing the section again will show the next repetition of the PAT on transport packet 532 and so on.


OC_abcd.mpg - PIDs
Active PIDs
PID 0 (0x0)
PID 16 (0x10)
PID 17 (0x11)
View Section
View Repetition
View Bitrate
OC_abcd.mpg - Section table_id 0 (0x0) PAT from packet 0
OC_abcd.mpg - Section table_id 0 (0x0) PAT from packet 532
OC_abcd.mpg - Section table_id 0 (0x0) PAT from packet 1064
PAT
table_id = 0x0
section_syntax_indicator = 1
0 = 0
reserved = 3
section_length = 17
00000000 00 B0 11 04 D2 C1 00 00 00 00 E0 10 00 01 E0 64
00000010 24 F2 07 48

Since the structure view is based on a script, the script can be edited and the presentation of the packet or message changed.

Right-clicking on the any item in the structure view will open this menu:

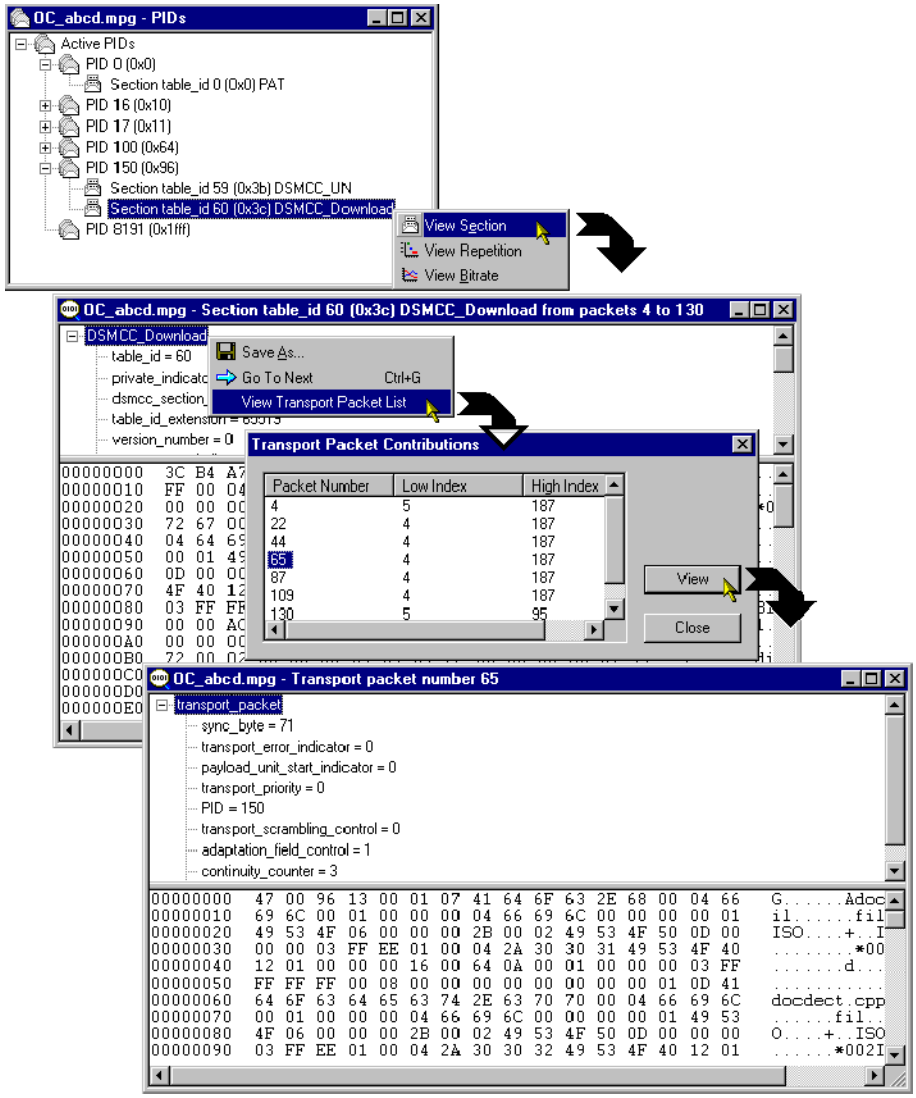
Using the **Save As**… option, the structure can be saved to a separate file.

The **Go To Next** option moves the structure view to the next repetition of the same item. If the current view is the last in the stream, the option will loop back to the first repetition in the stream.

The information displayed by the structure view may be carried in one or more transport packets. By right-clicking the item and selecting **View Transport Packet List**, a list of the transport packets carrying the information will be displayed. Highlighting a **Packet Number** and selecting **View** will display the selected transport packet structure. Several structure views can be opened in this way but the views are not enabled until the **Transport Packet Contributions** dialog is closed.

The Low and High Index entries in the **Transport Packet Contributions** dialog box indicate the first and last byte respectively of the packet that contributes to the structure.

The screenshots below illustrate an example of this sequence of actions:



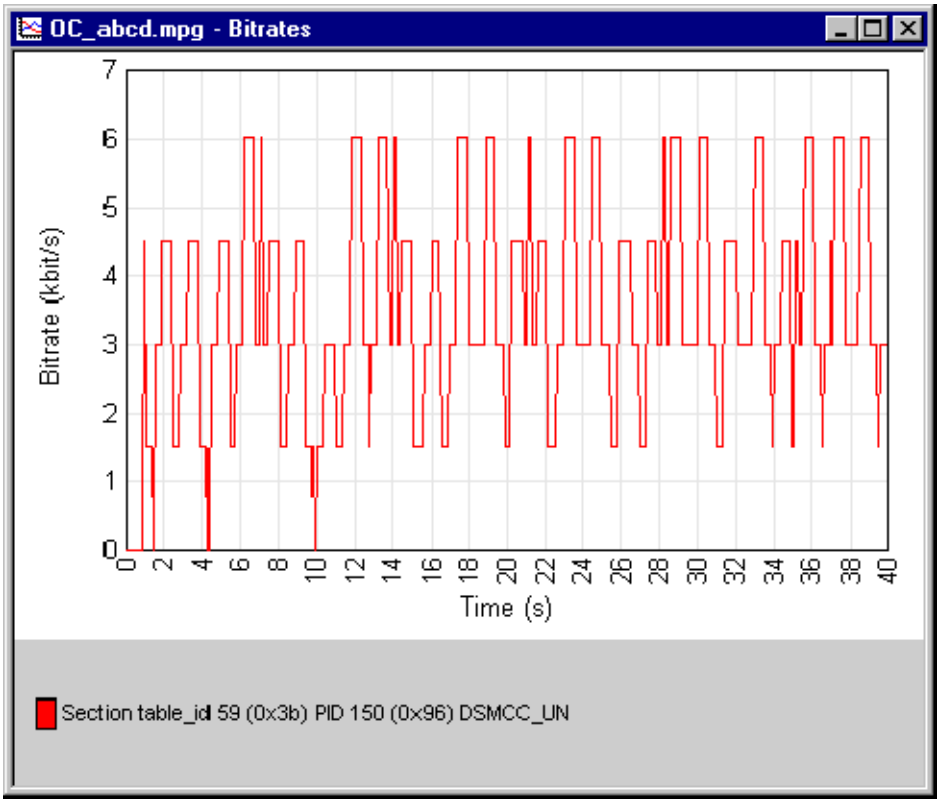
Bitrate View

Menu Bar: View > Bitrate **Toolbar**:

This structure view charts the bit rate of a set of transport entities (for example, BIOP message, PID, module). The bit rate calculation is a rolling average. For any transport entity the sum of the transport packets that contribute to that entity in each 100 ms time-slice are summed. The average is calculated every 100 ms using the last 10 time-slices (that is, the bit rate is the average over the last second).

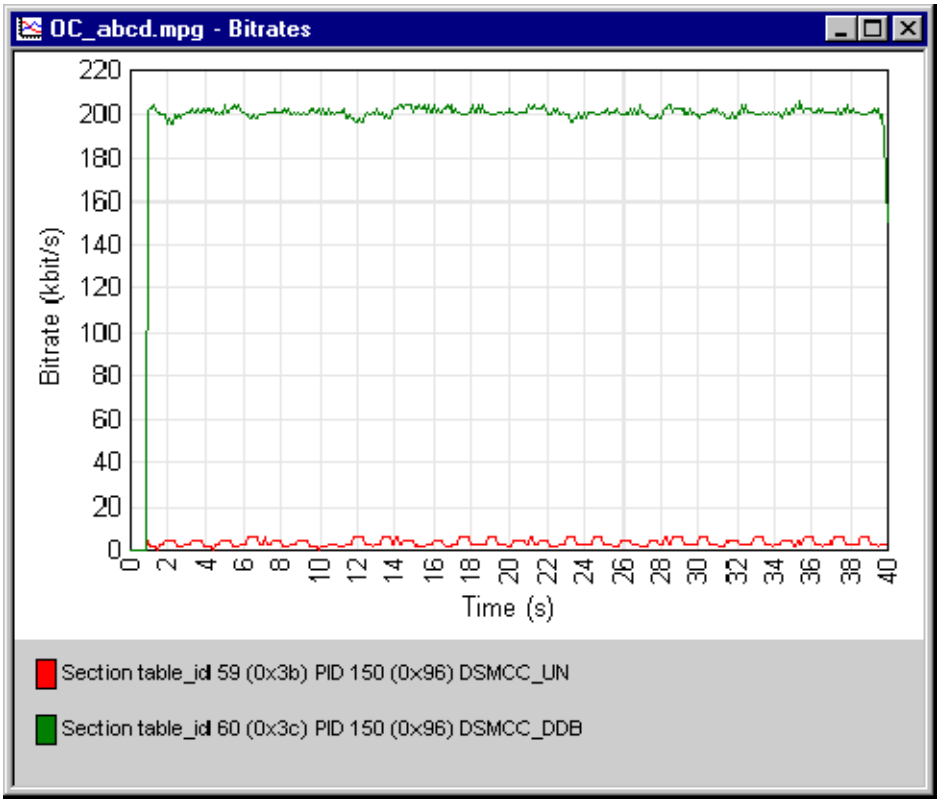
In some cases a choice is offered between displaying the bit rate of the selected element or a composite bit rate of the selected element and its subsidiary (nested) elements.

***NOTE**. In calculating bit rates, Carousel Analyzer returns to the stream file. For large files, the calculation may take an appreciable amount of time.*



The y-axis is automatically scaled to accommodate the maximum bit rate. The name of the element from which the bit rate is derived and the related graph are linked by color; a line (of the same color) is displayed to the right of the element name.

If the bit rate for a second element is requested, it is displayed on the same graph, as shown in the following illustration:



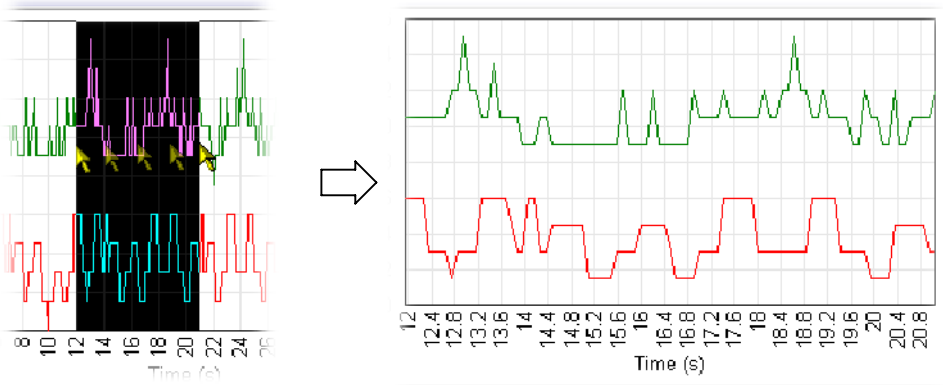
Any number of element bit rates can be displayed; each will be a separate color.

Inspecting Bitrates

It is possible to zoom in on an area of the graph in order to inspect the bit rate in detail.

To zoom in on the central 50% of the displayed graph, use the **Graph > Zoom > Zoom In** menu option (or the Toolbar button: ; or tab key). This action can be repeated.

To zoom in on any area of the bit rate graph, drag the mouse while holding the left-button, to highlight the area required. When the mouse button is released, the highlighted area will be enlarged to fill the graph area.



The menu option **Graph > Zoom > Zoom Out** (Toolbar: ; or shift-tab key) will zoom out one step at a time; a step being the previous zoom in actions.

The menu option **Graph > Zoom > Show All** (Toolbar:) will redisplay the graph with no zoom factor applied.

Saving/Copying

The graph can be saved or copied in text format or as a picture file (JPEG or bitmap).

Menu Option	Description
Graph > Save	Save the graph to a user defined location.
> Bitmap	Size the graph window before saving.
> JPEG	Size the graph window before saving.
> Table	Tab delimited format.
Graph > Copy	Copy to clipboard, from where it can be pasted into a suitable application:
> Image	
> Table	Tab delimited format.

Repetition View

Menu Bar: View > Repetition **Toolbar**:

This structure view charts the repetition of a set of data broadcast entities. This Gantt style graph displays a row for each transport entity (for example, BIOP message, U-N message etc) selected. A colored block on the row indicates the presence of the message at that point in the transport stream.

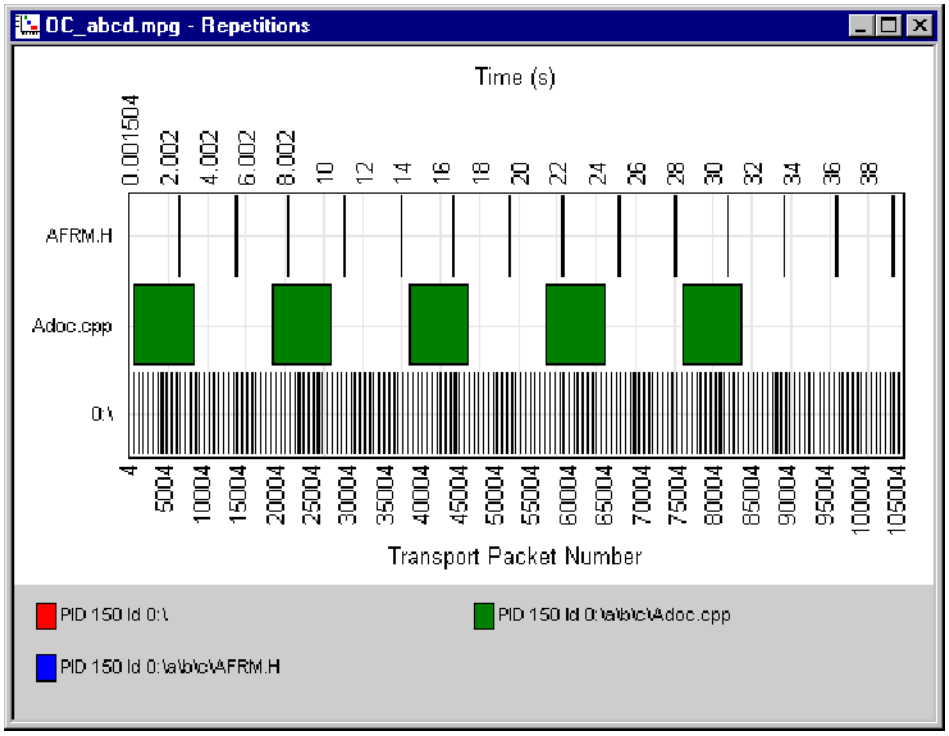
***NOTE**. In calculating repetition rates, Carousel Analyzer returns to the stream file. For large files, the calculation may take an appreciable amount of time.*

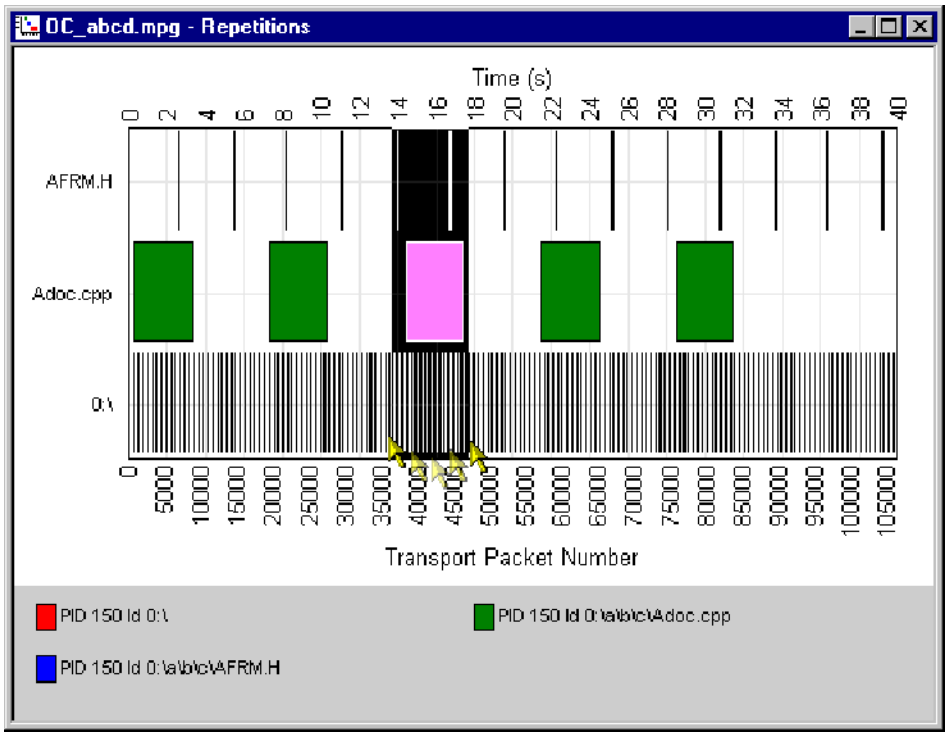
Inspecting Repetition Rates

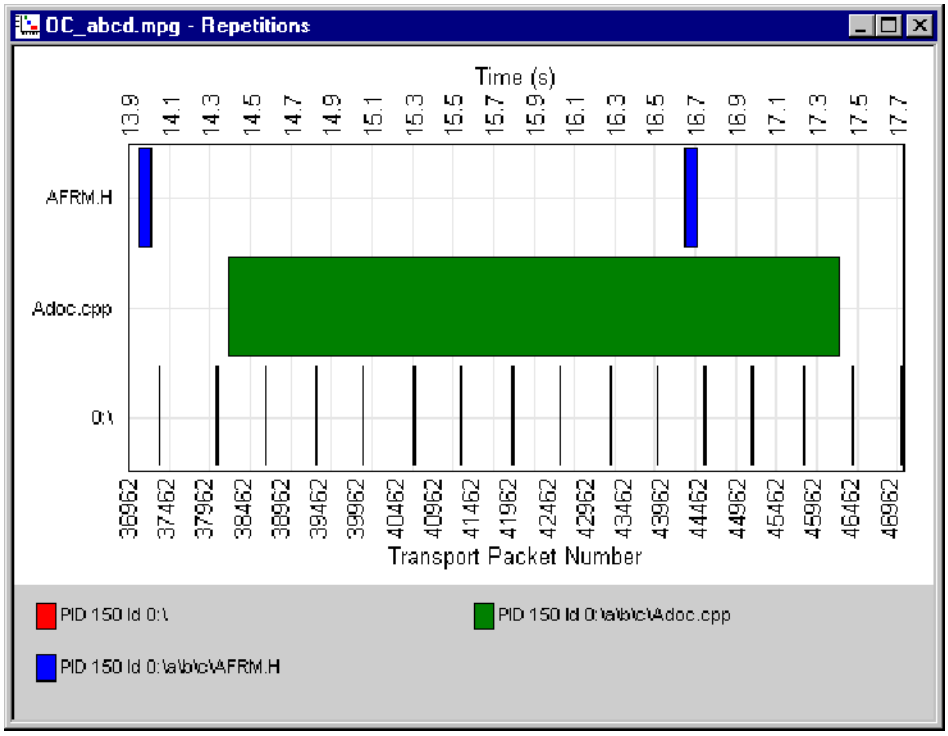
It is possible to zoom in on an area of the graph in order to inspect the repetition rate in detail.

To zoom in on the central 50% of the displayed graph, use the **View > Zoom > Zoom In** menu option (or the Toolbar button). This action can be repeated.

To zoom in on any area of the repetition rate graph, drag the mouse while holding the left-button, to highlight the area required. When the mouse button is released, the highlighted area will be enlarged to fill the graph area.




OC_abcd.mpg - Repetitions
Time (s)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
AFRM.H
Adoc.cpp
0:\
0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000 55000 60000 65000 70000 75000 80000 85000 90000 95000 100000 105000
Transport Packet Number
PID 150 Id 0:\
PID 150 Id 0:\a\b\c\Adoc.cpp
PID 150 Id 0:\a\b\c\AFRM.H


OC_abcd.mpg - Repetitions
Time (s)
13.9 14.1 14.3 14.5 14.7 14.9 15.1 15.3 15.5 15.7 15.9 16.1 16.3 16.5 16.7 16.9 17.1 17.3 17.5 17.7
AFRM.H
Adoc.cpp
0:\
36962 37462 37962 38462 38962 39462 39962 40462 40962 41462 41962 42462 42962 43462 43962 44462 44962 45462 45962 46462 46962
Transport Packet Number
PID 150 Id 0:\
PID 150 Id 0:\a\b\c\Adoc.cpp
PID 150 Id 0:\a\b\c\AFRM.H

The **View > Zoom > Zoom Out** menu option (Toolbar: or shift-tab key) will zoom out one step at a time; a step being the previous zoom in actions.

The **View > Zoom > Show All** menu option (Toolbar:) will redisplay the graph with no zoom factor applied.

Tooltips: When the cursor is placed over a block, a tooltip provides the PID, time, and packet number.

Saving/Copying

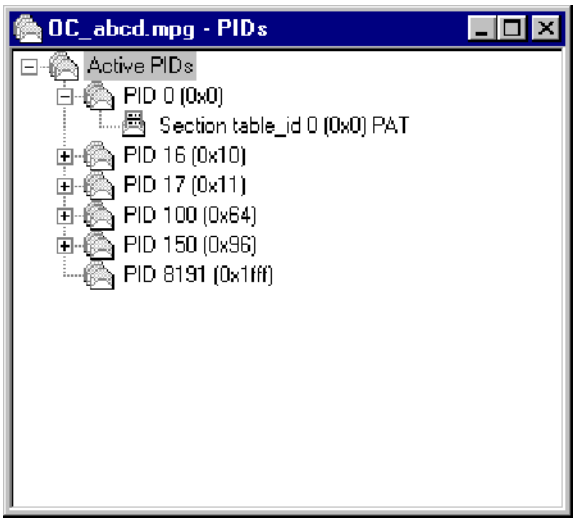
The graph can be saved or copied in text format or as a picture file (JPEG or bitmap).

Menu Option	Description
Graph > Save	Save the graph to a user defined location.
> Bitmap	Size the graph window before saving.
> JPEG	Size the graph window before saving.
> Table	Tab delimited format.
Graph > Copy	Copy to clipboard, from where it can be pasted into a suitable application.
> Image	Copy image.
> Table	Tab delimited format.

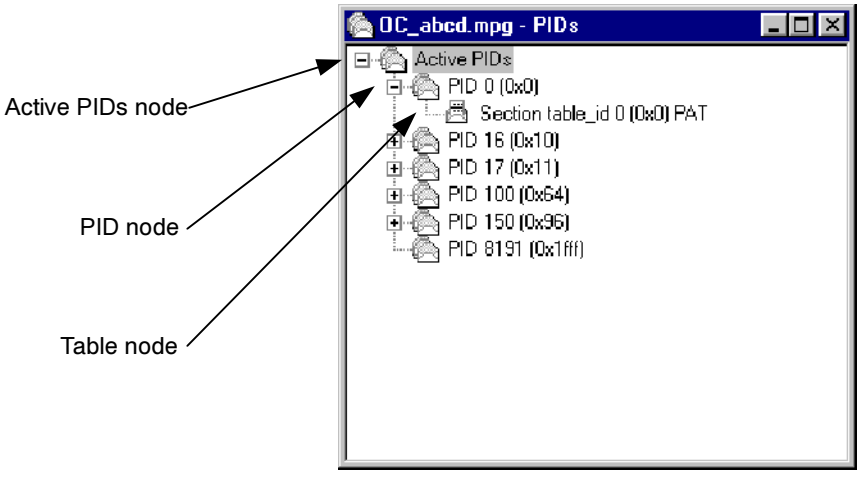
PID View

Menu Bar: View > PIDs Toolbar:

This static view displays all the active PIDs within the transport stream. A PID carrying sections will have nested items, which detail the table types on that PID. The structure, bit rate, and repetition of transport packets and sections are available from this view.



The following diagram indicates the nodes accessible from the PIDs view.



Active PIDs node

This node represents all the PIDs found in the current transport stream; the PIDs are listed as child items.

Right-Click Menu Options.

View Transport Packet

Displays a structure view of the packet at the current stream position (as indicated by the Transport Packet number displayed in the Transport Packet Bar).

PID node

Represents all the transport packets with a particular PID. If the PID carries sections then the PID tree node will have child table tree nodes.

Right-Click Menu Options.

View Transport Packet

Displays a structure view of the next transport packet encountered on this PID from the current stream position (as indicated by the Transport Packet number displayed in the Transport Packet Bar).

View Cycle Time > Allows either cycle time statistics or graphical view to be selected.

View Repetition Activates or creates a view of the repetition of this PID in the transport stream.

View Bitrate Activates or creates a view of the bit rate of this PID.

Table node

This node represents the stream of sections present on a specific PID with a specific table identity.

Right-Click Menu Options.

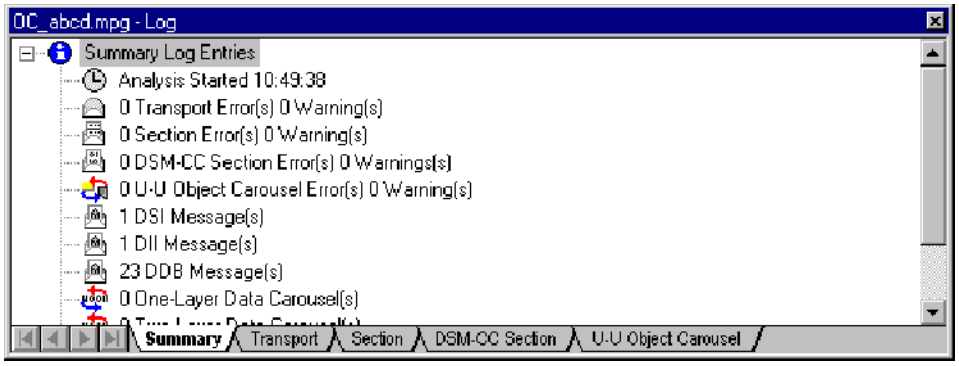
View Section	Displays a structure view of the next section with this PID and table identity that can be formed from the current stream position onwards (as indicated by the Transport Packet number displayed in the Transport Packet Bar).
View Cycle Time >	Allows either cycle time statistics or graphical view to be selected.
View Repetition	Activates or creates a view of the repetition rate of this PID with this PID and table identity.
View Bitrate	Activates or creates a bit rate view of sections with this PID and table identity.
Signal Carousel	(See *Manual Signaling*, page 6–39.)

Log View

Menu Bar: View > Log **Toolbar**:

The log view is a tabbed window with each tab representing information about a particular MPEG-2 layer. Each tab contains any miscellaneous information about the transport stream that has been analyzed. For example, packets that have the transport_error_bit set will have an entry in the transport log tab.

The diagram below indicates the information that is accessible from the Log view.



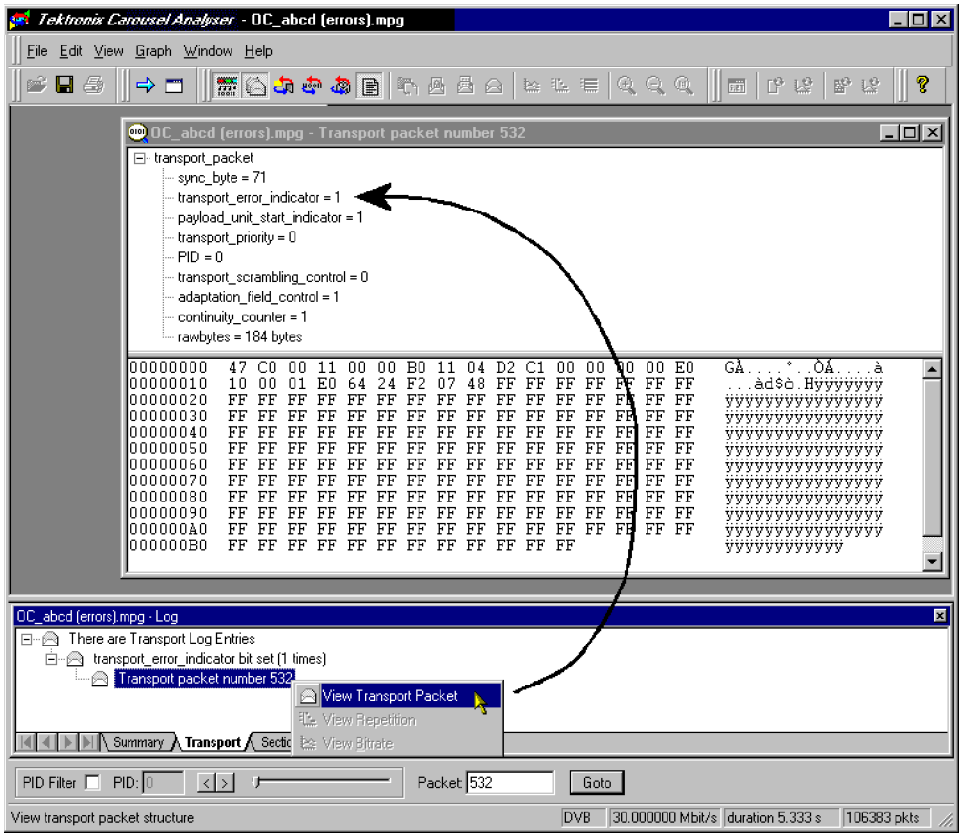
Summary This view provides a summary of the transport stream analysis.

Transport Packet Log view

This view displays the errors that have been logged in transport packets during analysis of the stream.

Right-Click Menu Options.

View Transport Packet	Displays a structure view of the highlighted transport packet.



Section Log view

This view displays the errors that have been logged in sections during analysis of the stream.

Right-Click Menu Options.

View Section Displays a view of the highlighted section.

DSM-CC Section Log view

This view displays the errors that have been logged in DSM-CC sections during analysis of the stream.

Right-Click Menu Options.

View Section Displays a view of the highlighted DSM-CC section.

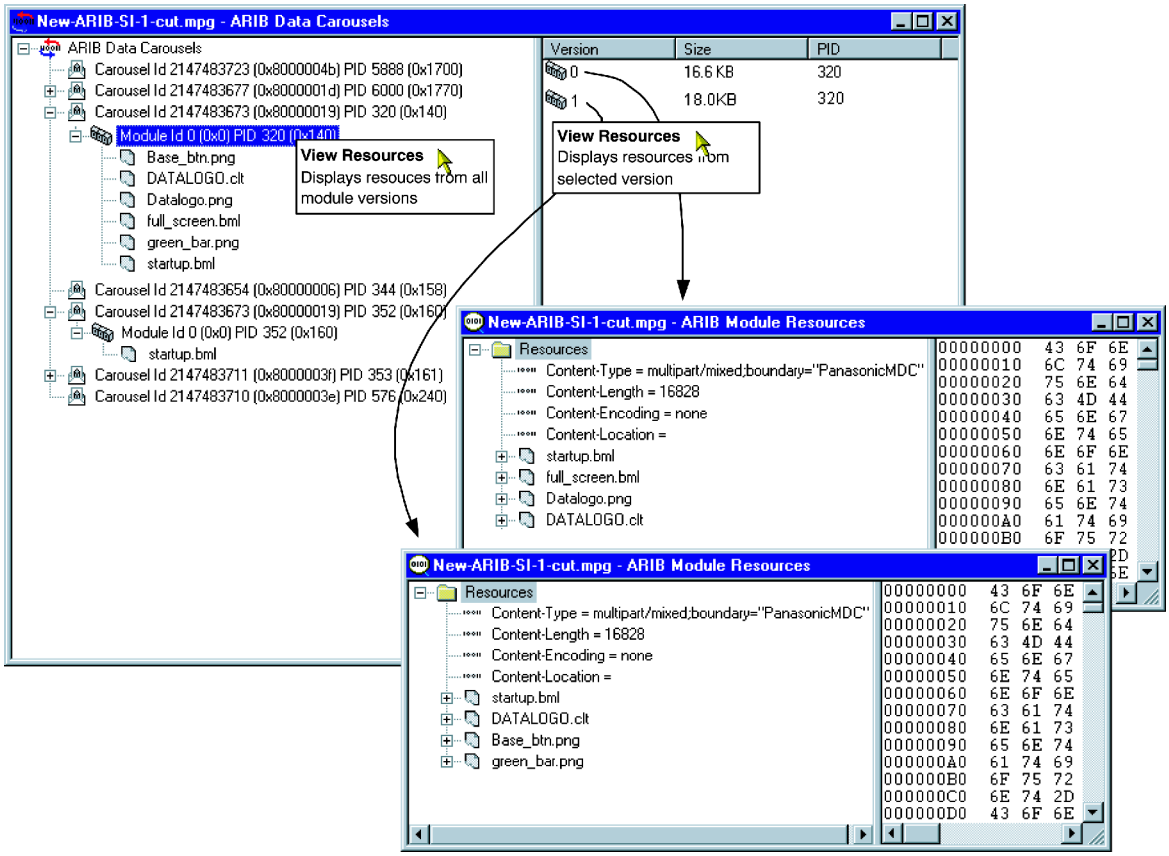
U-U Object Carousel

This view displays the warnings that have been logged in U-U Object sections during analysis of the stream.

Cycle Times View

Cycle times can be calculated for either a carousel (given a starting point) or an entity in the transport stream.

In the following diagram, a carousel is shown carrying objects A, B and C.



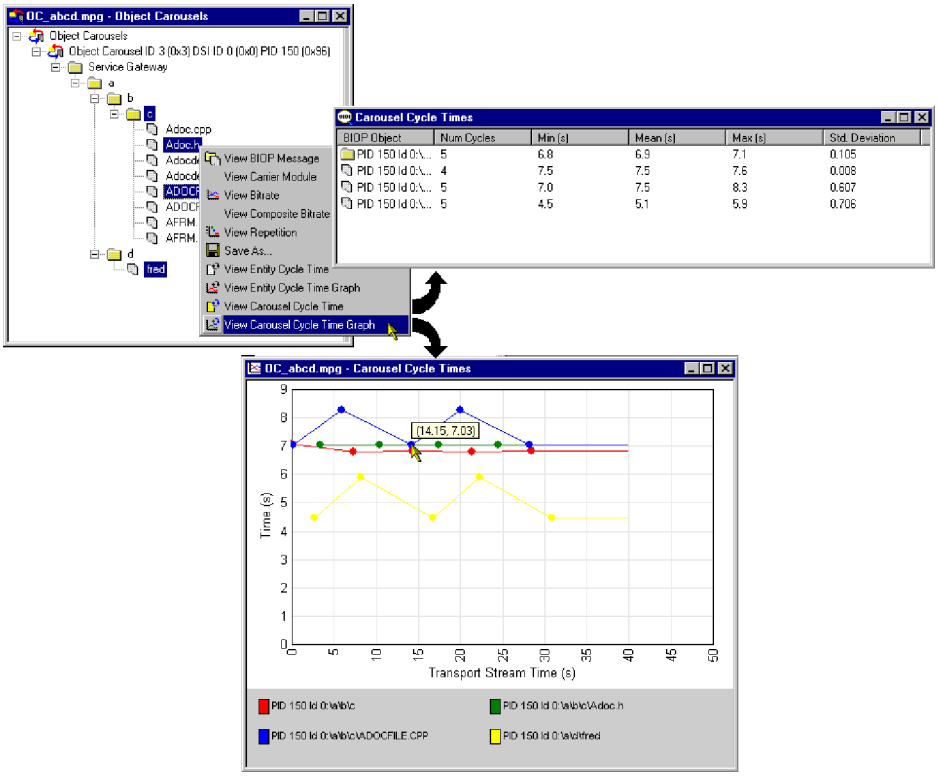
In this example, object B is identified as the starting point for both carousel and entity cycle timing. The cycle time of a carousel is the time taken to receive all of the objects within the carousel given a specified starting point in the carousel. The cycle time of any given entity in the transport stream (including Section, BIOP Object, PID and U-N Message) is the time taken from the start of an instance to the start of the next instance.

The cycle times calculated give the maximum, minimum and mean times for the occurrences of an object in a transport stream in seconds; standard deviation and number of cycles found will also be displayed. The statistics can also displayed in graphical format.

Carousel Cycle Times Statistics

The cycle time of an object carousel is the time taken for all components of the carousel to be received starting with a selected component of the carousel.

Selecting one or more BIOP objects from a carousel and **View Carousel Cycle Time** from the right-click menu generates the **Carousel Cycle Times** statistics window. The information can also be displayed in graphical form by selecting **View Carousel Cycle Time Graph**.



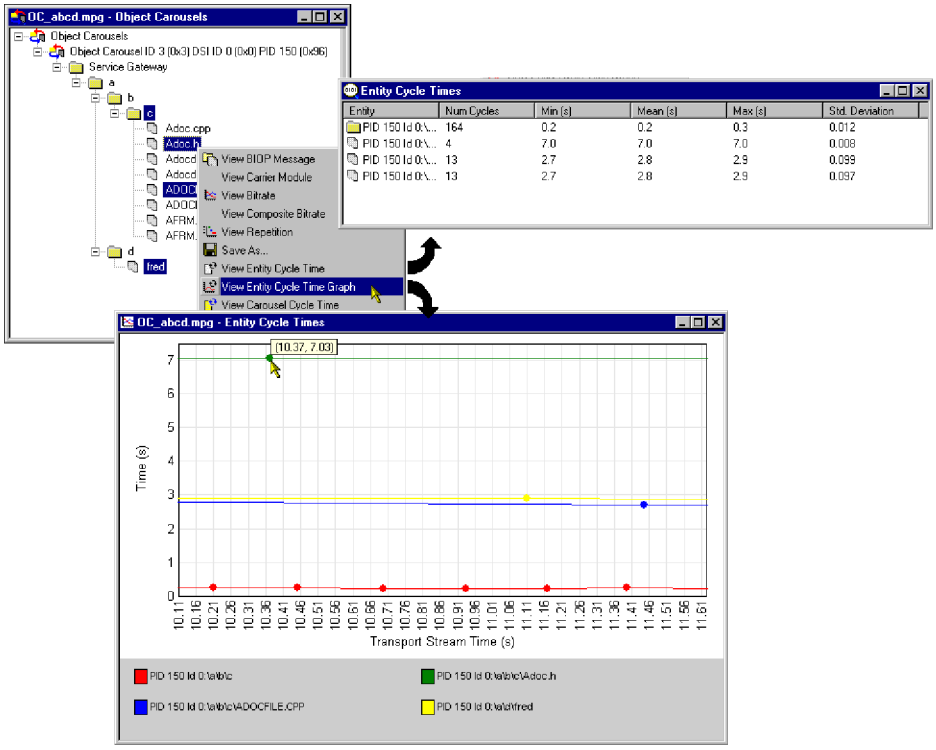
In the Carousel Cycle Times window, the BIOP Object column identifies the PID, Carousel ID and Object that the user identified as a starting point for the test.

The information can also be displayed in graphical form.

Entity Cycle Times Statistics

Similarly, the cycle time of any entity (object) in the transport stream is the time between the start of an instance of the entity and the start of the next instance.

Selecting one or more entities in any view and **View Entity Cycle Time** from the right-click menu generates the **Entity Cycle Times** statistics window. The information can also be displayed in graphical form by selecting **View Entity Cycle Time Graph**.



The Entity column identifies the PID, Carousel ID and Object that the user identified as a starting point for the test.

In both Carousel and Entity statistics windows, further cycle time statistics will be added to the bottom of the list while the window remains active.

Similarly, with one or more entries in a **Cycle Times** window selected, the right-click menu allows the user to display a graph of the cycle times or export cycle time statistics to a text file.

Application Support

Carousel Analyzer provides a means of testing the effects of associating applications with Object Carousels. An application consists of a “boot class” and “assets”. Typically, a boot class will comprise a Java or HTML class; assets may be images or text required by the boot class.

A comprehensive range of tests and measurements is provided in addition to application management tools.

A single Object Carousel may be timed with several applications in the Carousel Analyzer.

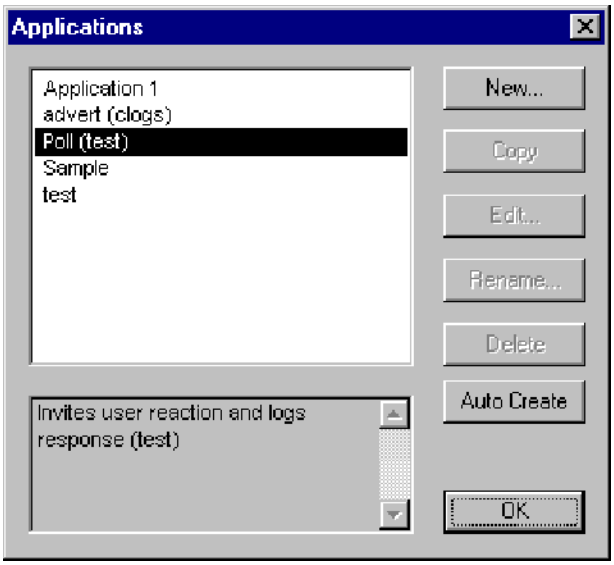
Application Management

The Application management dialog shows the applications currently defined and allows the user to manage them. The user can also create new applications.

When defining an application, it may be done by adding application tree nodes manually using context menus, or by moving parts of currently available object carousels over to the application. It is also possible to move over sub-trees from the hard disk to the application definition.

If an asset is specified as a wildcard, the timing will wait for that asset and all child assets that are found in the transport stream. This means that a directory can be specified as a wildcard asset and any content found underneath it in the transport stream will be treated as an asset, for example, specify \bin\start-tup.class as the boot class, and \images\ as a wildcard directory asset. Any content in the \images\ directory in the carousel will be treated as an asset.

To open the **Applications** management dialog, select **Edit > Applications...**. The following dialog box is displayed:



In the Applications management dialog, the main list displays those applications that have already been created. Application data is stored locally in the file C:\Program Files\Tektronix\DataTestSystem\applications.dat; this is the installation directory but it may have been modified by the user. This data file can be copied to other Carousel Analyzer installations if required.

A summary of the highlighted application is displayed below the list; the user should enter this summary when the application is created.

The dialog button functions are described as follows:

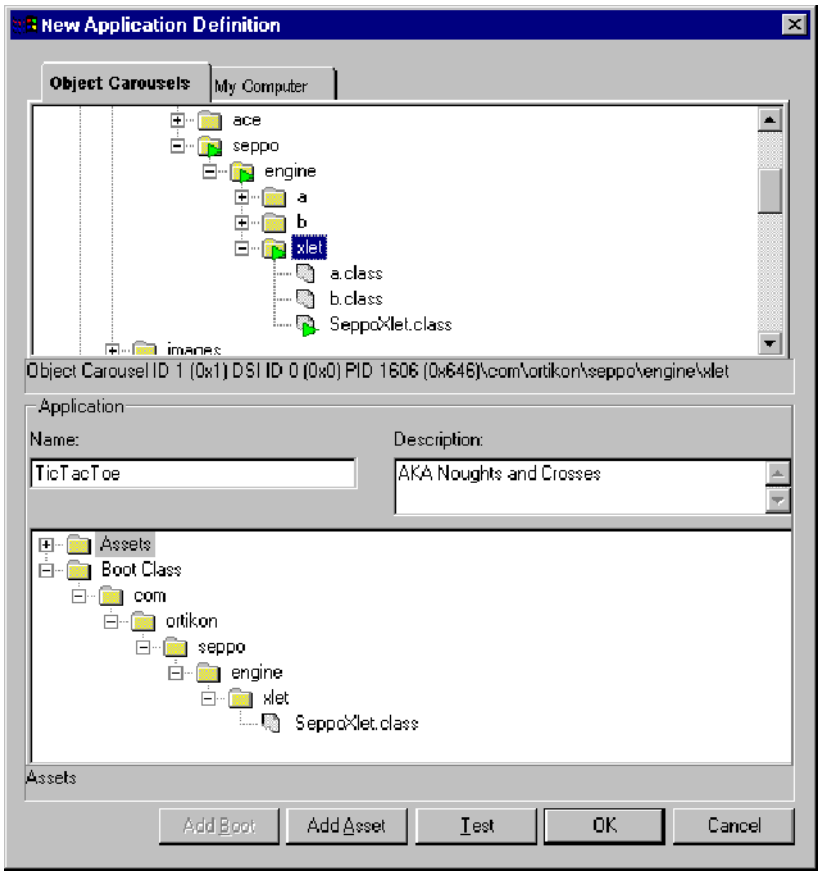
New	Allows a new application to be defined in the **New Application Definition** dialog box. Keyboard shortcut: **Insert**.
Copy	Creates a copy of the highlighted application. The new application is allocated a modified name (**Copy of** …).
Edit…	Allows the highlighted application to be edited in the **Edit Application Definition** dialog box. Shortcut: Double-click application name.
Rename…	Allows the highlighted application to be renamed. Keyboard shortcut: **F2**.
Delete	Deletes the highlighted application after receiving confirmation from the user. Keyboard shortcut: **Delete**.

Auto Create — Creates an application definition for each MHP application that is found in the stream. The boot class for each application is also set up.

Select **OK** to close the dialog box. All of the buttons, except **New**, are disabled unless an application is highlighted; **New** is always enabled.

Application Definition

Applications are defined using the **New Application Definition** dialog as shown in the following illustration:

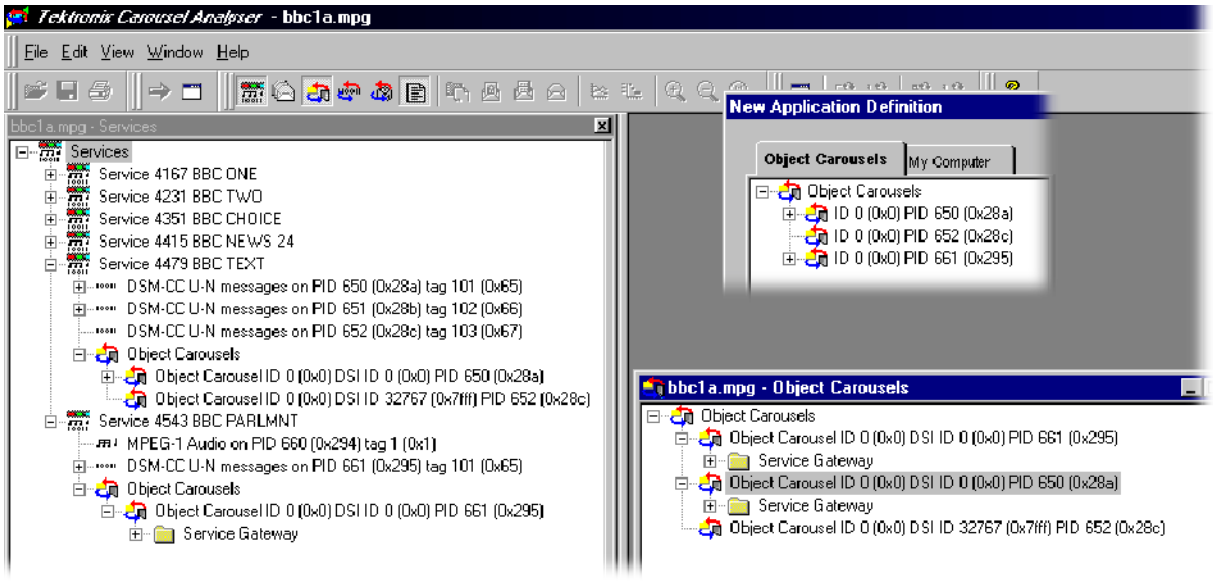


(Initially the Application panes will be empty except for the root nodes (**Boot Class** and **Assets**)).

The elements of the **New Application Definition** dialog box are as follows:

Object Carousels tab: This displays all of the object carousels in the current transport stream. Note that if the current transport stream carries no object carousels, then none will be displayed here.

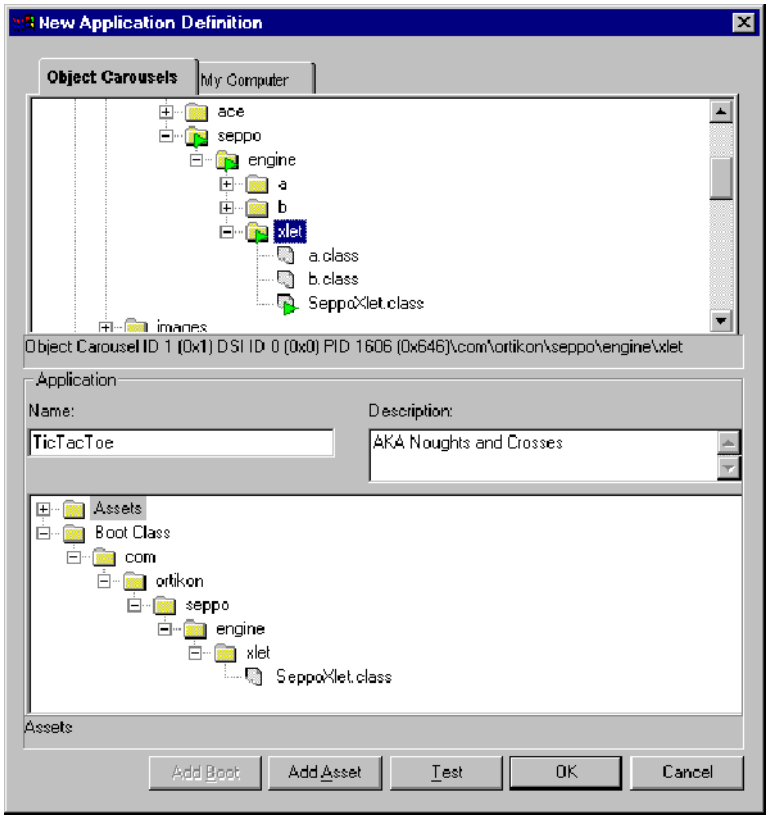
The example screenshot below shows the Object Carousels displayed in the **New Application Definition** dialog box overlaid onto the standard Object Carousel views.


Tektronix Carousel Analyser - bbc1a.mpg
File Edit View Window Help
bbc1a.mpg - Services
Services
Service 4167 BBC ONE
Service 4231 BBC TWO
Service 4351 BBC CHOICE
Service 4415 BBC NEWS 24
Service 4479 BBC TEXT
DSM-CC U-N messages on PID 650 (0x28a) tag 101 (0x65)
DSM-CC U-N messages on PID 651 (0x28b) tag 102 (0x66)
DSM-CC U-N messages on PID 652 (0x28c) tag 103 (0x67)
Object Carousels
Object Carousel ID 0 (0x0) DSI ID 0 (0x0) PID 650 (0x28a)
Object Carousel ID 0 (0x0) DSI ID 32767 (0x7fff) PID 652 (0x28c)
Service 4543 BBC PARLMNT
MPEG-1 Audio on PID 660 (0x294) tag 1 (0x1)
DSM-CC U-N messages on PID 661 (0x295) tag 101 (0x65)
Object Carousels
Object Carousel ID 0 (0x0) DSI ID 0 (0x0) PID 661 (0x295)
Service Gateway
New Application Definition
Object Carousels
My Computer
Object Carousels
ID 0 (0x0) PID 650 (0x28a)
ID 0 (0x0) PID 652 (0x28c)
ID 0 (0x0) PID 661 (0x295)
bbc1a.mpg - Object Carousels
Object Carousels
Object Carousel ID 0 (0x0) DSI ID 0 (0x0) PID 661 (0x295)
Service Gateway
Object Carousel ID 0 (0x0) DSI ID 0 (0x0) PID 650 (0x28a)
Service Gateway
Object Carousel ID 0 (0x0) DSI ID 32767 (0x7fff) PID 652 (0x28c)

Name Enter the name of the application.

Description An optional field that allows a brief description of the application to be entered.

The boot class and the assets are displayed as parts of a tree structure in the lower pane. The boot class is the object that must be loaded first in an application (an executable image). Assets are data objects to be used by the Boot Class in the same carousel (for example, picture files, and text files).



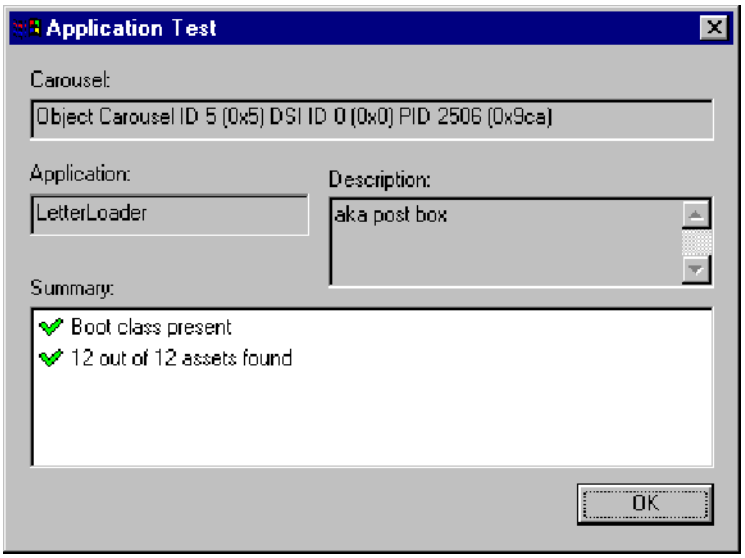
Selecting the **OK** button closes the dialog box and stores the new application data. The action will be refused if a boot class object has not been specified. If a duplicate application name has been entered, it must be renamed.

The boot class must be in the associated carousel; if it is not, the timing test cannot be performed. An asset is a BIOP object in the carousel that is used by the boot class. If the asset is not in the associated carousel, the user will be warned that the assets could not be found and the tests will be performed as if those assets had not been defined.

Selecting the **Cancel** button closes the dialog and discards the new application data.

Testing an Application

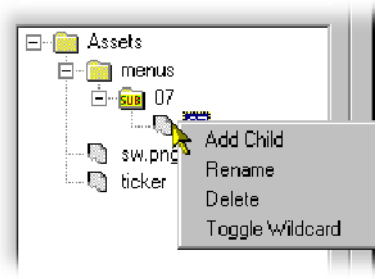
The **Test** button at the bottom of the application dialog box allows items in the application to be tested against the currently selected carousel. This can be used to ensure that the correct carousel has been selected for the application and that all of the objects are present. The results of the test are displayed in the **Application Test** dialog.



Adding Objects to the Application

Objects are moved from the Object Carousel pane to the Boot Class or Asset panes using the **Add Asset** button. T do this, highlight the object in the Object Carousel pane, select **Add Asset**, and note that the object is added to the adjacent application structure.

- Making a node that has children an asset will automatically include all the children as assets. To include every object in a carousel, add the carousel root node to the application.
- The boot class can only contain one object; it may be at any depth in the directory structure.
- Adding an object to the Boot Class will displace any existing object.
- Moving assets from the Object Carousel will automatically recreate the directory structure from the object carousel.
- Moving assets from the hard disk directory tree will only recreate the structure below the source tree node. When moving assets from the directory tree, highlight a node in the asset tree as a target.
- A right-click context menu is available at all nodes in the application structure; available options will depend on the node type.



The context menu options operate on the currently highlighted node in the application structure as follows:

Add Child	Adds a child node. It can be subsequently renamed to indicate an object.
Rename	Allows a node to be renamed.
Delete	Deletes the node.
Toggle Wildcard	Asset directory nodes can be identified as wildcard entries. A wildcard directory indicates that the directory and all of its children at the time of analysis are defined as assets.

Editing an Application

Application editing is similar to creating a new application.

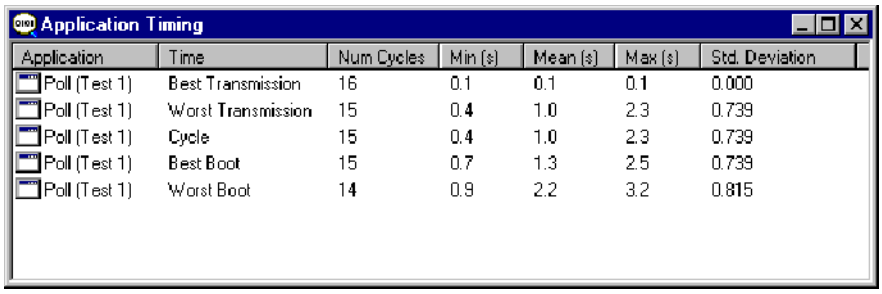
Application Timing

The Application Timing feature allows the user to observe the effect in terms of download time of one or more applications being timed with an object carousel.

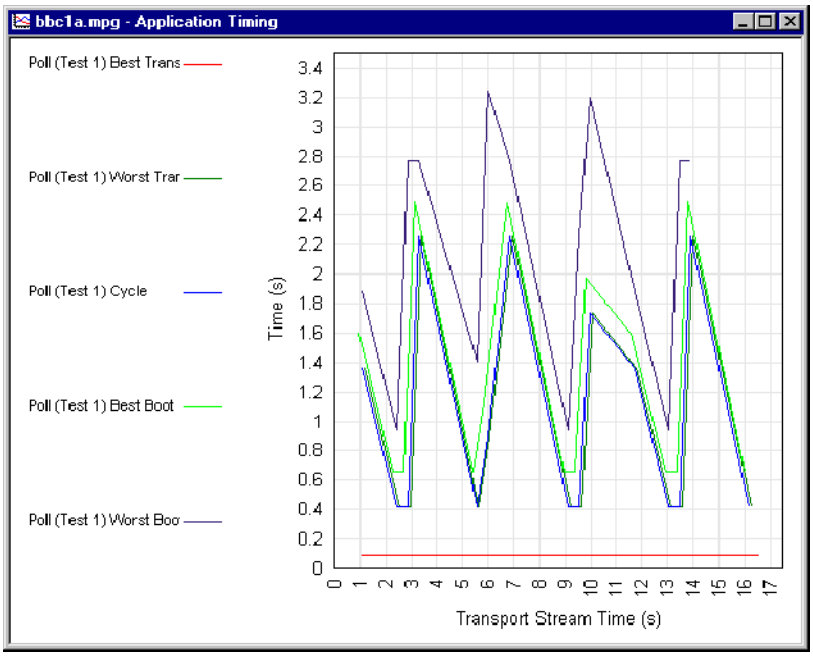
In practice, an object carousel is identified and one or more applications are selected from the current application list to be timed with it. As each application is selected, the software will check the availability of the Boot Class and Assets. If the Boot Class cannot be found, the timing operation will fail. If Assets cannot be found, the timing tests can still be performed, but they will not represent the true effect of the application on a particular carousel.

Progress bars are displayed while the tests are being performed.

The results of the application timing tests are presented in tabular form.


Application Timing
Application
Time
Num Cycles
Min (s)
Mean (s)
Max (s)
Std. Deviation
Poll (Test 1) Best Transmission 16 0.1 0.1 0.1 0.000
Poll (Test 1) Worst Transmission 15 0.4 1.0 2.3 0.739
Poll (Test 1) Cycle 15 0.4 1.0 2.3 0.739
Poll (Test 1) Best Boot 15 0.7 1.3 2.5 0.739
Poll (Test 1) Worst Boot 14 0.9 2.2 3.2 0.815

Data displayed in tabular form can be displayed in graphical form or exported to a tab separated file.


bbc1a.mpg - Application Timing
Poll (Test 1) Best Trans
Poll (Test 1) Worst Trar
Poll (Test 1) Cycle
Poll (Test 1) Best Boot
Poll (Test 1) Worst Boo
Time (s)
Transport Stream Time (s)

Explanation of Timing Tests

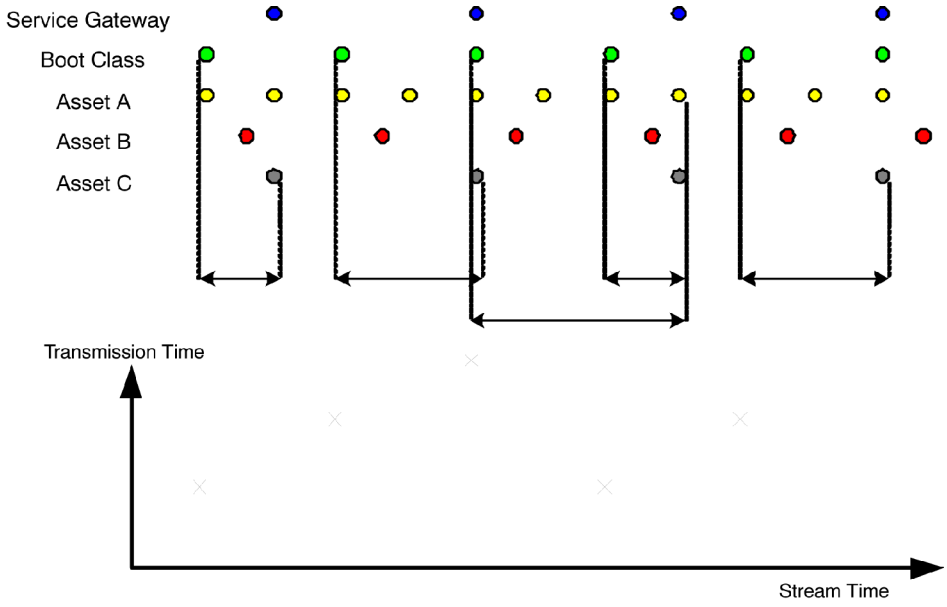
This section gives a graphical explanation of each of the application timing tests.

The calculations assume that control information (DSI/DII; that is, SI/PSI information, for example, PAT, PMT) has been cached.

The boot class must be received before any of the assets can be received. This simulates the STB not knowing which carousel objects the boot class depends on until it has completely received and processed it.

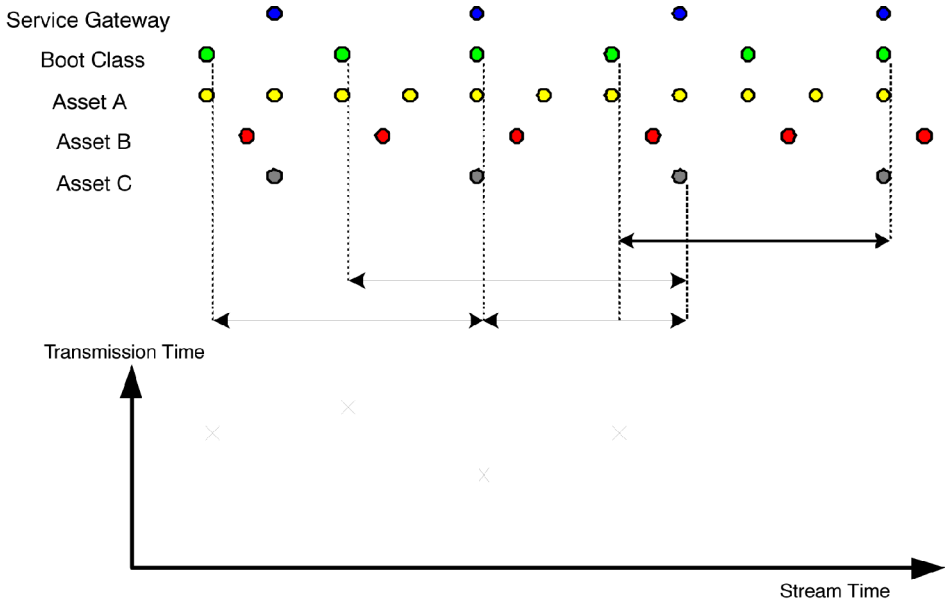
Best Transmission Time. From the start of a boot class to the end of the last asset.

The true application load time is the transmission time plus the time taken by the set-top box (STB) to load the application. The time taken by the STB to load the application is not included in these tests.

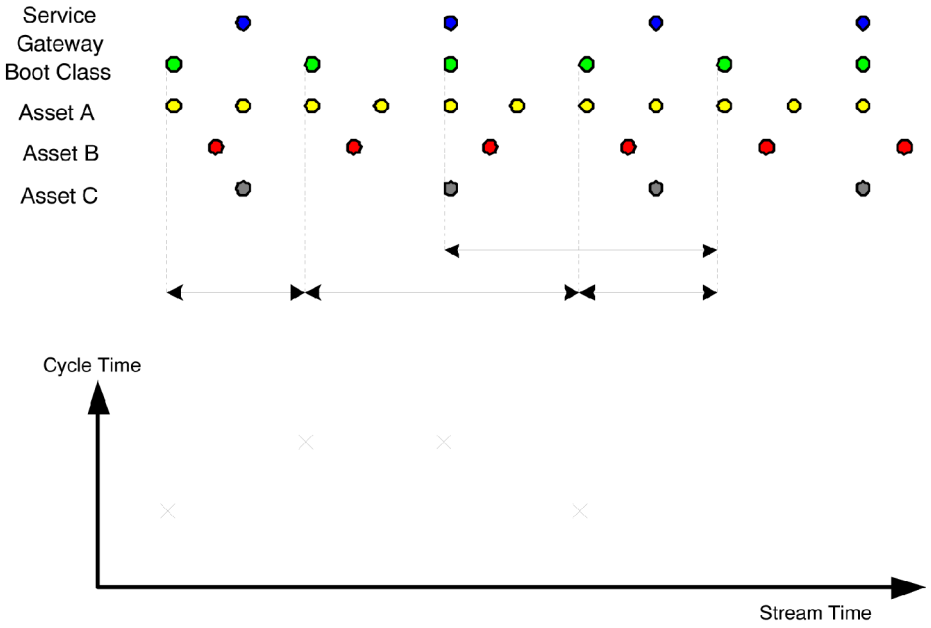


Worst Transmission Time. From the end of a boot class, through the next boot class, to the end of the last asset.

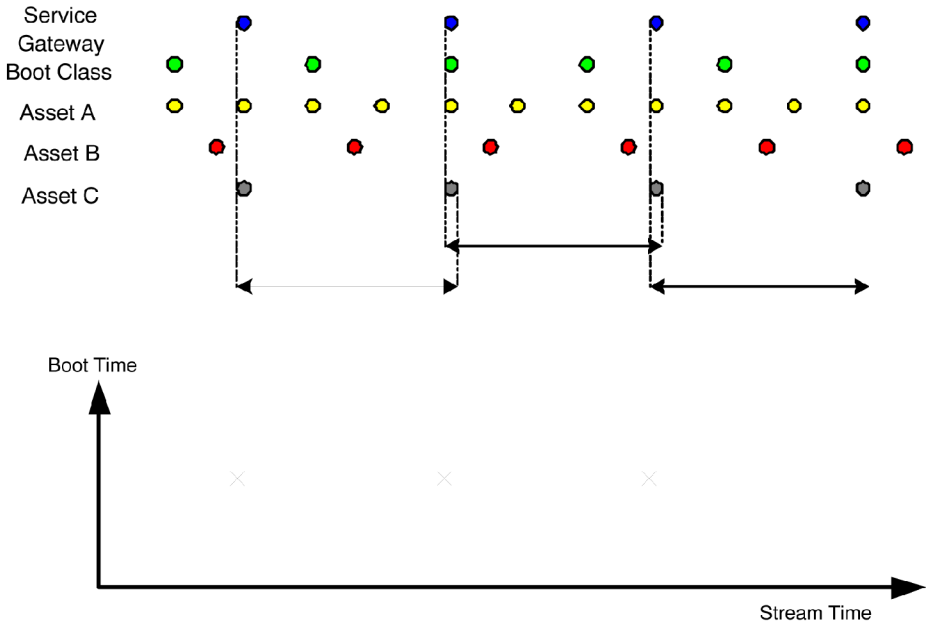
The true application load time is the transmission time plus the time taken by the set-top box (STB) to load the application. The time taken by the STB to load the application is not included in these tests.



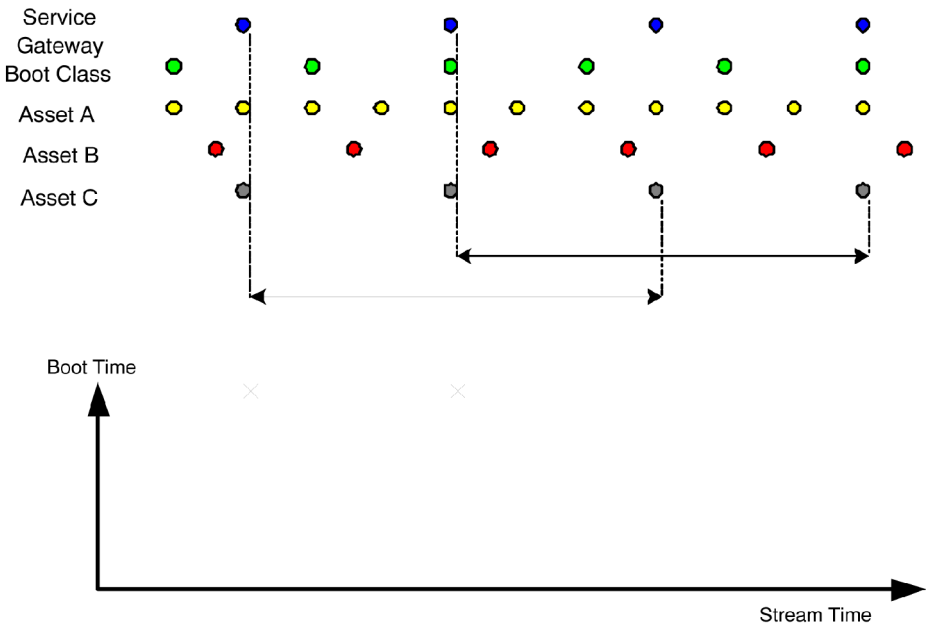
Cycle Time. From the start of a boot class, through the last asset, to the start of the next boot class.



Best Boot Time. From the start of a service gateway, through the next boot class, to the end of the last asset.



Worst Boot Time. From the end of a service gateway, through the next service gateway, through the next boot class, to the end of the last asset.



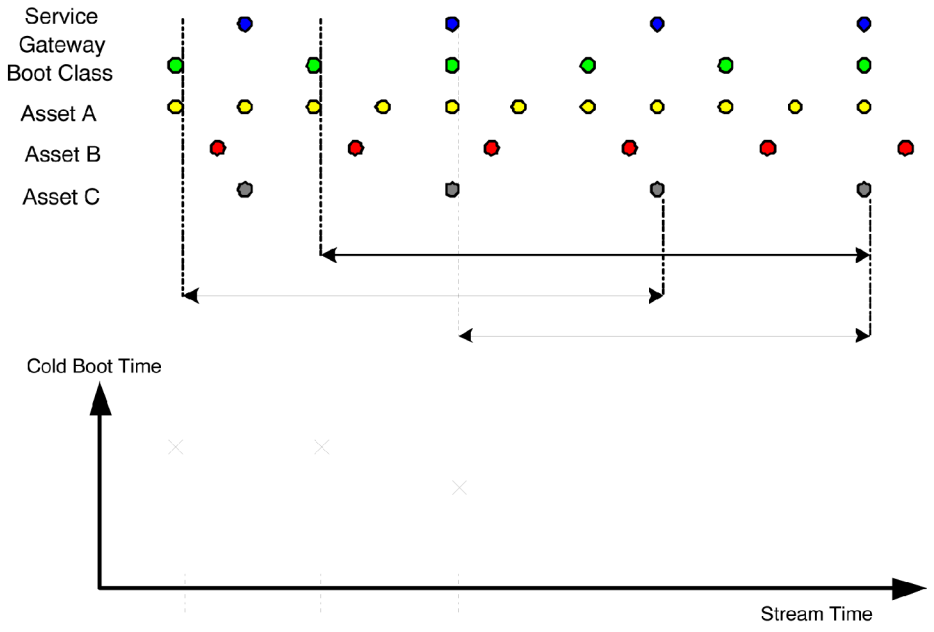
Cold Boot Time. Whereas the other timing methods assume that control information (PAT, PMT, DSM-CC section, etc.) has been cached, this method does not.

The user defines a sampling frequency, which is timed to start the download and observe how long it takes to signal the carousel and download the service gateway, the boot class and all of the assets. For example, in a 60-second stream, a **Start Point** (on the **Cold Boot Time Settings** dialog) of five seconds will sample the download time twelve times. The result is added to the Application Timing results table and graph.

The boot class must be received before any of the assets can be received. This simulates the STB, not knowing which carousel objects the boot class depends on until it has completely received and processed it.

Directories must be received before any child objects can be received in this case. This is because this timing method assumes no signaling caching.

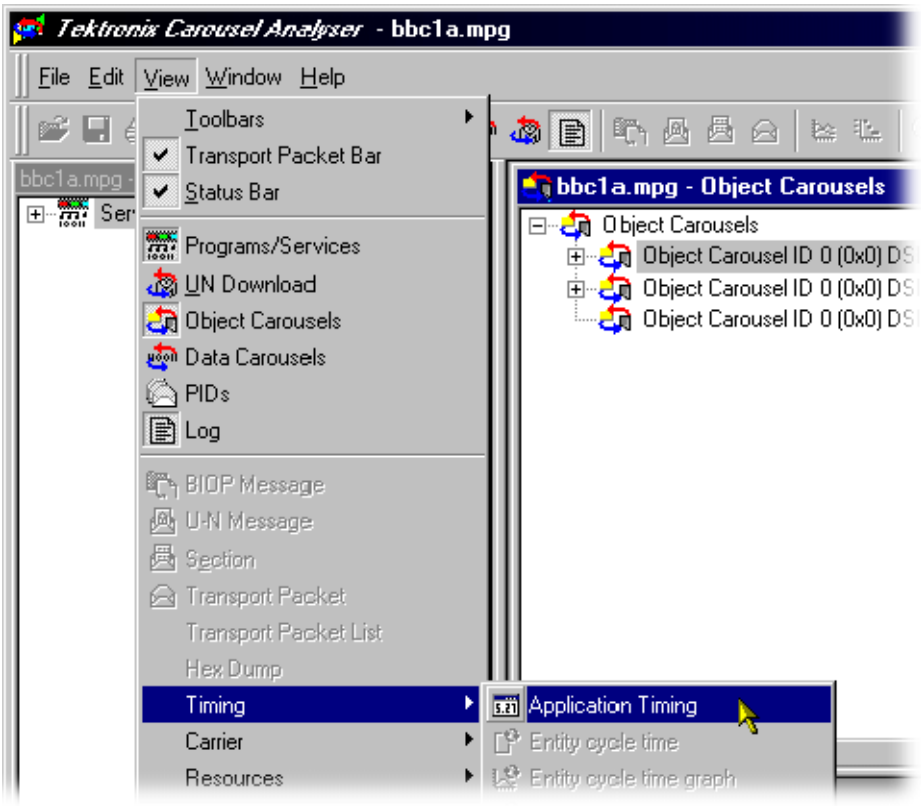
The end of each cycle will be the end of the module containing the last asset. This is an important distinction because an asset may not be the only one in that module.



Setting up a Timing Test

It is assumed that applications have been created as described in the previous section.

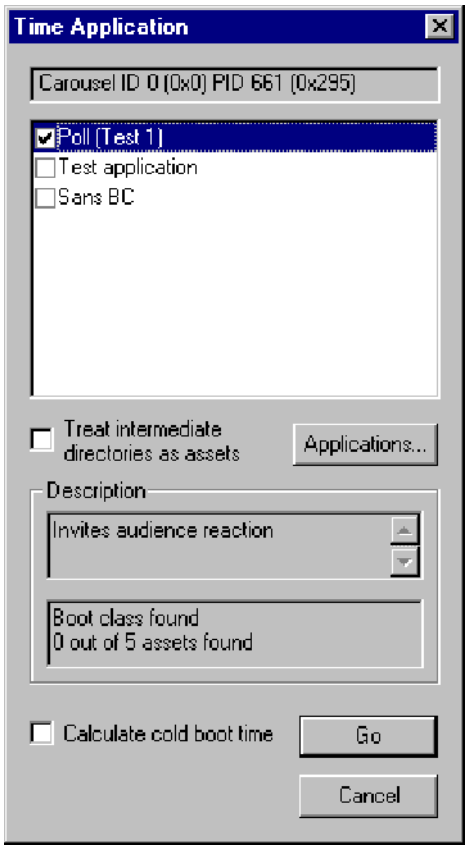
1. With the Object Carousel view active, select **View > Timing > Application Timing**.



Alternatively, highlight an object carousel and select **View Application Timing** from the right-click menu (not shown).

2. The **Timing Application** dialog is displayed:

   The dialog displays the selected object carousel identity and the applications that are already defined.



   Applications to be associated with the object carousel are selected by enabling the adjacent checkbox.

   Highlighting an application name will display its description and a brief report on the availability of the boot class and assets. If the boot class is reported as being not present, the timing operation will be aborted after the first test pass.

   Select **Applications**… to open the **Applications** management dialog (see page 6-71).

   On first opening this dialog, a simple test is performed to detect the presence of the required boot classes. Applications for which the boot class is found will be enabled.

   Subsequently, user selections will be recalled.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

Treat Intermediate Directories as Assets:

If this checkbox is enabled, all directories that form part of the asset path are also treated as assets. They must be downloaded as part of the timing test. This will not usually have any significant impact on the results because directories are generally much smaller and transmitted at a higher frequency than files.

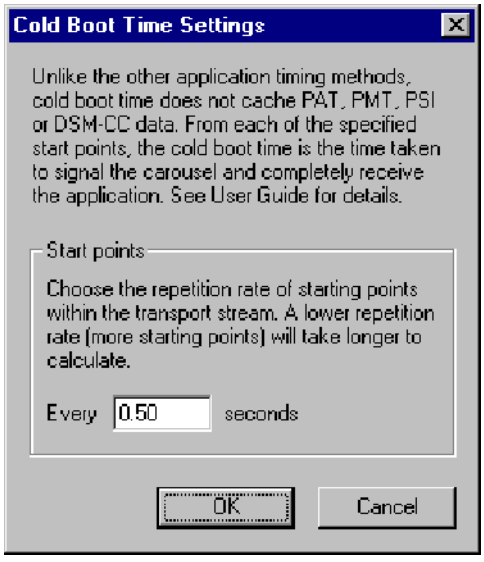
Calculate Cold Boot Time:

If this checkbox is enabled, the Cold Boot timing test will be applied (see page 6–84); this may take some time.

***NOTE**. In MHP mode, if the Cold Boot time is to include the AIT acquisition time, the Application Timing selection must be made from an MHP application node (Java or HTML). By selecting an MHP application, the application's AIT will be automatically included in the Cold Boot timing.*

3. Select **Go** to start the timing tests.

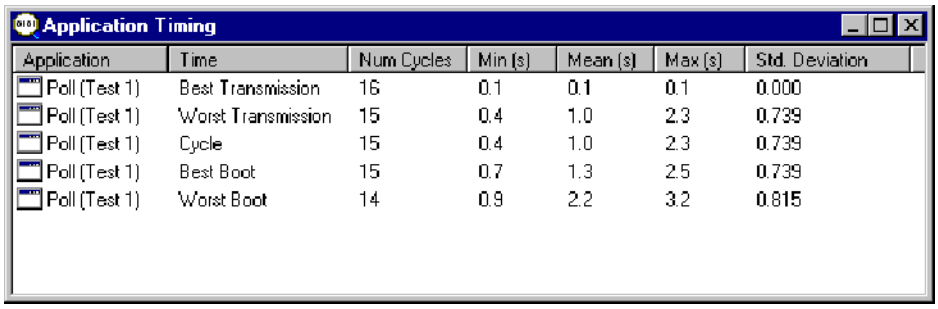
If the Calculate cold boot time checkbox was enabled, the Cold Boot Time Settings dialog is displayed. Enter the starting point repetition rate required.


Cold Boot Time Settings
Unlike the other application timing methods, cold boot time does not cache PAT, PMT, PSI or DSM-CC data. From each of the specified start points, the cold boot time is the time taken to signal the carousel and completely receive the application. See User Guide for details.
Start points
Choose the repetition rate of starting points within the transport stream. A lower repetition rate (more starting points) will take longer to calculate.
Every
0.50
seconds
OK
Cancel

Select **OK** to continue with the tests.

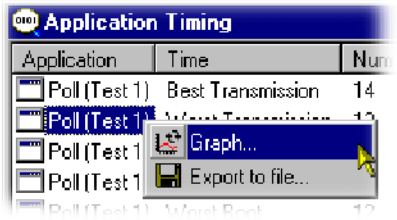
Progress bars will be displayed while the test is being carried out.

4. On completion of the test, the **Application Timing** results table is displayed.


Application Timing
Application
Time
Num Cycles
Min (s)
Mean (s)
Max (s)
Std. Deviation
Poll (Test 1) Best Transmission 16 0.1 0.1 0.1 0.000
Poll (Test 1) Worst Transmission 15 0.4 1.0 2.3 0.739
Poll (Test 1) Cycle 15 0.4 1.0 2.3 0.739
Poll (Test 1) Best Boot 15 0.7 1.3 2.5 0.739
Poll (Test 1) Worst Boot 14 0.9 2.2 3.2 0.815

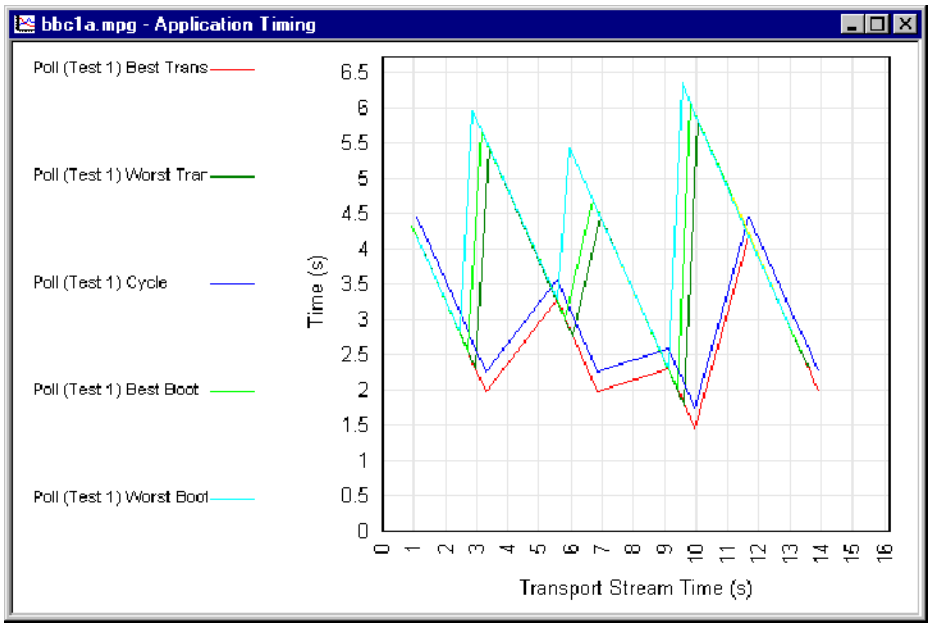
The column headings are largely self-explanatory. **Number of Cycles** shows the number of times that the test could be calculated for the stream.

5. To display the results in graphical form, highlight a test name and select **Graph**… from the right-click menu.



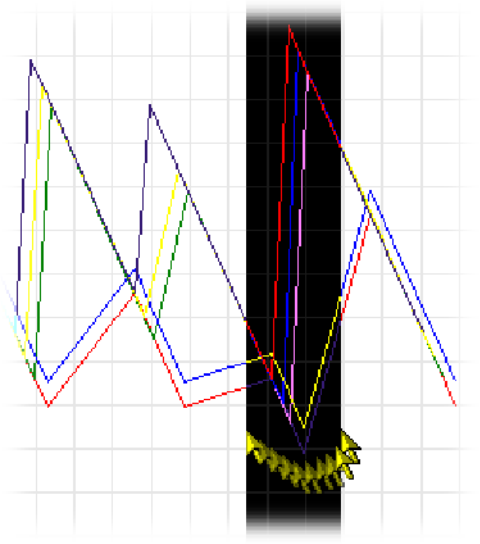
If another test is selected, the results are overlaid. Color coding is used to identify each result.

The screenshot below illustrates a graph showing all five test results (Cold Boot not shown).

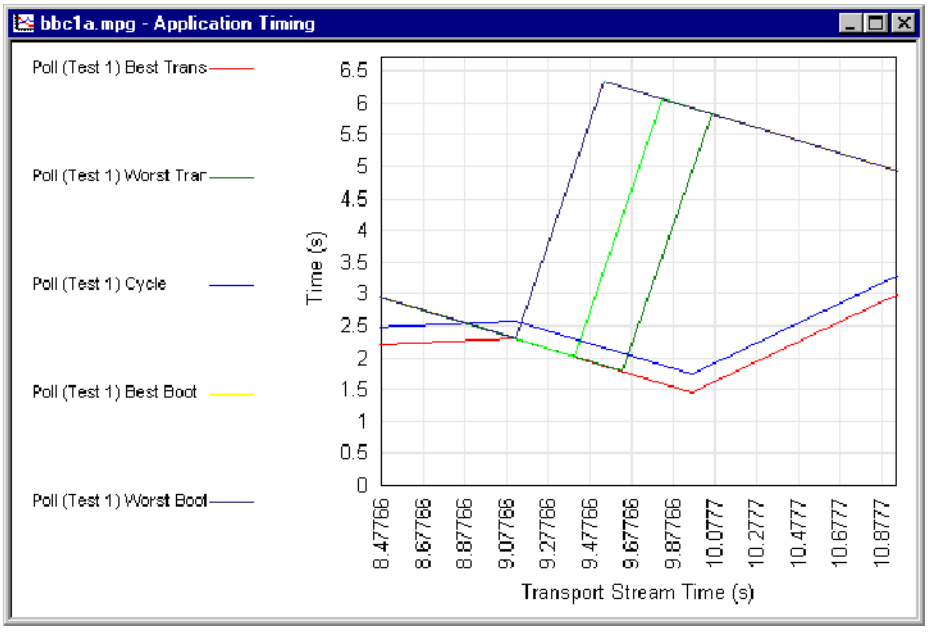

bbc1a.mpg - Application Timing
Poll (Test 1) Best Trans
Poll (Test 1) Worst Trar
Poll (Test 1) Cycle
Poll (Test 1) Best Boot
Poll (Test 1) Worst Boot
Time (s)
Transport Stream Time (s)

Zoom in and zoom out buttons are provided on the toolbar (or use the tab and shift-tab keys on the keyboard).

Alternatively a precise area can be selected by dragging the mouse over the required range (hold the left-button, move the mouse, release the button).

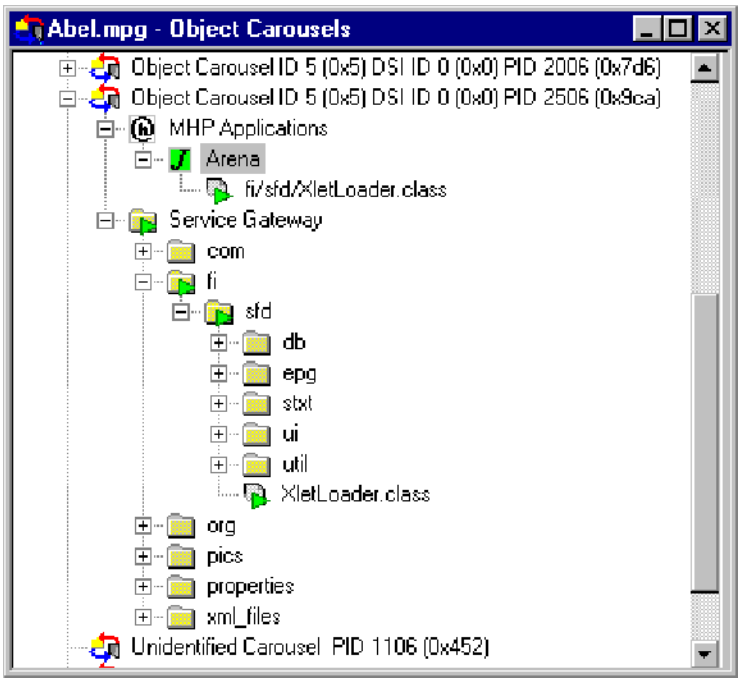


When the mouse button is released, the zoomed area of the graph will be displayed immediately (as shown below).



MHP Support

Although described separately here, MHP Object Carousel support is fully integrated into Carousel Analyzer. MHP applications are displayed in the Services and Object Carousel views. The features described here can be accessed from menu options and right-click context menus.



The MHP application ( ) is identified by its name in the AIT. If the boot class is found in the Service Gateway, it is attached as a child of the MHP application. As a visual aid, boot class items are identified in the Service Gateway by green triangles overlaying the primary icon. The path in which the boot class resides is also indicated by green triangles.

Applications are designated as Java ( ) or HTML ( ). The color of the icon represents the running status of the application when the carousel was recorded; green indicates running, yellow indicates ready and red indicates not running.

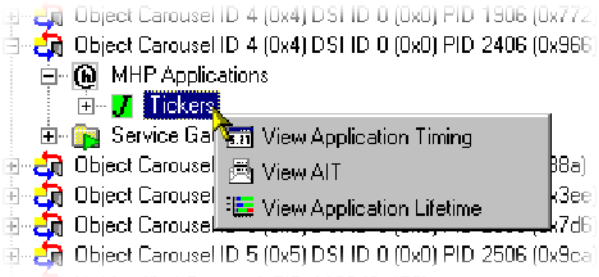
Right-Click Menu Options

Right-click on an MHP application node to display the following menus:

View Application Timing
(See *Application Timing*, page 6-71)

View AIT
Opens the AIT structure view (see also *Structure Views*, page 6-52)

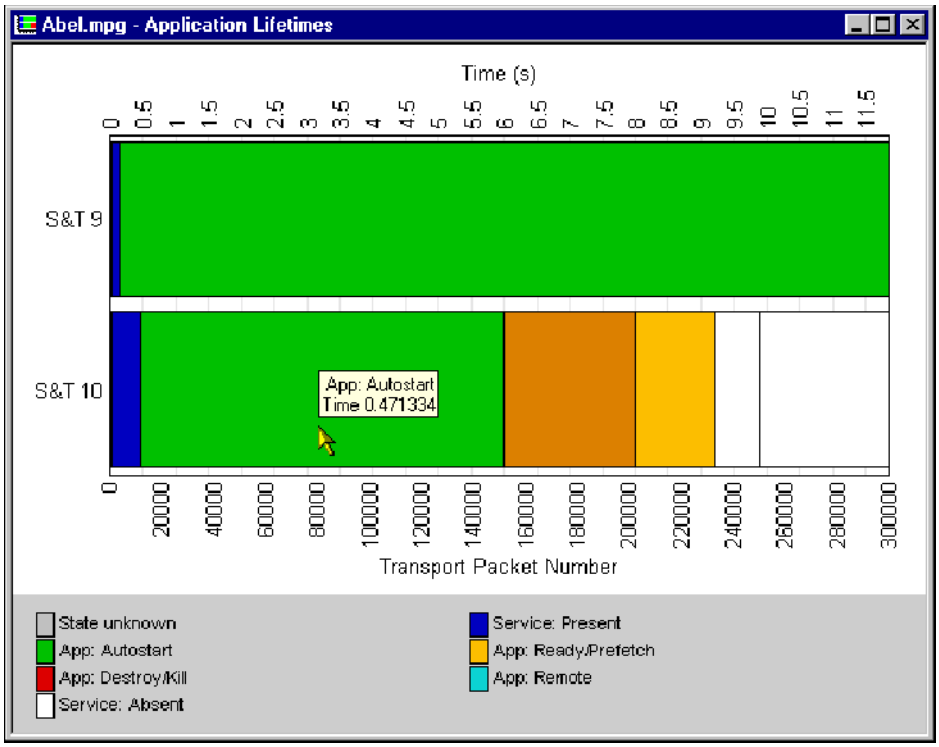
View Application Lifetime
(See *Application Lifetimes*, page 6-71)



Application Lifetimes

This Gantt style graph displays an analysis of the lifetime of an MHP application. Multiple applications can be displayed; each application is subdivided and color-coded to indicate the changing state of the application.

The Applications Lifetimes view can be opened by highlighting an MHP application node and selecting either the toolbar icon or **View Application Lifetime** from the right-click menu.



A key to the color codes is displayed at the bottom of the view. Each application is labeled. Placing the cursor over a color block displays details of the block, including the block start time.

Reference

Script Files

The following scripts (Table 6–11) are shared between the Carousel Analyzer They exist in the Tektronix\Scripts directory.

Table 6-11: Script Files - General

Script file name	Purpose
MPEG.scp	Scripts for MPEG sections and descriptors.
DVB.scp	Scripts for DVB sections and descriptors.
ISDB-T.scp	Script for ISDB-T sections and descriptors.
ISDB-S.scp	Script for ISDB-S sections and descriptors.
MHP.scp	Script for AIT table.
MPE.scp	Scripts for DVB datagrams.
DSMCCv2.scp	General purpose DSMCC structures.
DSMCC.scp	Scripts for (DVB) DSM-CC sections.
ISDB_DSMCC.scp	ISDB version of the DSM-CC script.

The following scripts (Table 6–12) are used only by the Carousel Analyzer. They exist in the Tektronix\DataTestSystem\Scripts directory.

Table 6-12: Script Files - Carousel Analyzer

Script file name	Purpose
Transport.scp	Script for transport packets.
Pat_Cat.scp	Script for PAT and CAT sections.
Biop.scp	Scripts for BIOP messages.
DSMCC_DataCarouselObject.scp	Script for DSM-CC objects, which relate a Data Carousel.
DSMCC_DataCarouselSection.scp	Script for DSM-CC sections, which relate a Data Carousel.
DSMCC_ObjectCarouselObject.scp	Script for DSM-CC objects, which relate an Object Carousel.
DSMCC_ObjectCarouselSection.scp	Script for DSM-CC sections, which relate an Object Carousel.
DSMCC_Object	Script for DSM-CC objects, whose content is not assumed to be either data or objects.

Error Checking

DSM-CC sections have two bit fields called section_syntax_indicator and private_indicator (Ref 13818-6 section 9.2.2). If the section_syntax_indicator field is 1, there is a CRC32 at the end of the section; if set to 0, there is a checksum at the end of the section. The private_data field should always be the complement of the section_syntax_indicator field.

If both these fields are set to the same value, the application cannot be absolutely sure whether a CRC or a checksum is being used. It therefore attempts to use the CRC method first and then the checksum. If neither method works, the section is rejected.

Currently nothing will be reported in the error logs if these bits are set incorrectly. This issue will be addressed in a future release of Carousel Analyzer.

Acronyms and Abbreviations

AIT	Application Information Table
ARIB	Association of Radio Industries and Businesses
BIOP	Broadcast Inter-ORB (Object Request Broker) Protocol
DDB	Download Data Block
DII	DownloadInfoIndication message
DSI	DownloadServerInitiate message
DSM-CC	Digital Storage Media - Command and Control
DTV	Digital Television
DVB	Digital Video Broadcasting
ID	Identity
IOR	Interoperable Object Reference
JPEG	Joint Photographic Experts Group
MHP	Multimedia Home Platform
MPEG	Moving Picture Experts Group
PID	Packet IDentifier
PMT	Program Map Table
PSI	Program Specific Information
SDT	Service Description Table
SI	Service Information
U-N	User to Network
U-U	User to User

References

[1] ISO/IEC 13818-1 Information technology - Generic coding of moving pictures and associated audio information: Systems [MPEG]

[2] ISO/IEC 13818-6 Information technology - Generic coding of moving pictures and associated audio information - Part 6: Extension for Digital Storage Media Command and Control [MPEG]

[3] ETS 300 468 Digital broadcasting systems for television, sound and data services; Specification of Service Information in Digital Video Broadcasting [DVB]

[4] EN 301 192 Specification for data broadcasting [DVB]

[5] A027 Specification for the transmission of data services in DVB bitstreams [DVB]

[6] A047 Implementation guidelines for Data Broadcasting [DVB]

[7] SI-DAT 382 Rev.4 Implementation guidelines for data broadcasting [DVB]

[8] Digital terrestrial television MHEG5 specification [DTG]

[9] ISO/IEC 13522-5:1996(E) MHEG-5 IS [MHEG]

[10] A tutorial introduction to MHEG-5 [Authors: Strategy and Technology Ltd]

[11] ARIB STD - B24 Data Coding and Transmission Specification for Digital Broadcasting

[12] Multimedia Home Platform, ETSI TS 101 812 v1.1.1 [DVB]

Carousel Generator

Getting Started

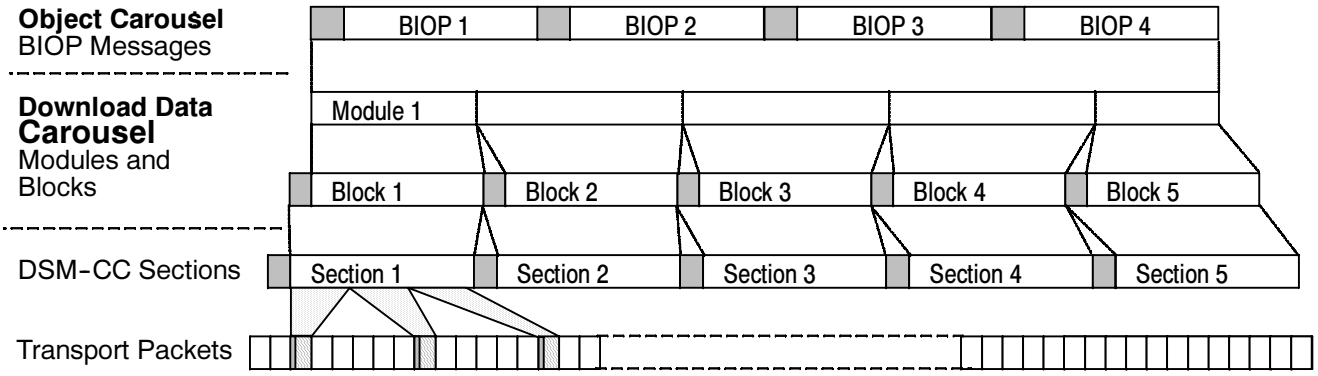
The Carousel Generator is aimed principally at the content provider user who simply wants to create a carousel to deliver content to a set-top box quickly and efficiently. The product also aims to support the more experienced MPEG user who wants to modify a carousel to test the effects on equipment along the broadcast chain. Similarly, the more experienced MPEG user can incorporate a carousel into a transport stream alongside video and audio content.

The assembled transport stream can be saved to an MPEG file.

Data Broadcasting Overview

Data Broadcasting allows data to be transmitted in a similar way to the way in which video and audio services are delivered to end users. Object and Data Carousels are intended for the periodic transmission of information in a transport stream. Data Carousels contain modules of data of unspecified content, whereas Object Carousels contain identifiable data objects, such as JPEG files, text files and, application software. Multimedia Home Platform (MHP) builds on object carousels by defining parameters such as the boot class and application life cycle in the Application Information Table (AIT).

The diagram below shows how information carried by data and object carousels is subdivided and ultimately carried by the transport stream.



BIOP messages contain a message header, a message sub-header and the message body, which contains data. The message body may contain complete data objects.

BIOP messages are broadcast in modules. A module is formed from one or more concatenated, complete BIOP messages.

Each Module is fragmented into one or more Download Data Blocks that are in turn transmitted in corresponding DSM-CC Sections.

Sections are transmitted in packets in the Transport Stream.

Carousel Generator Overview

Activity in the Carousel Generator is referred to as a “session”. During a session, data objects are assembled into one or more carousels. Video and audio content can also be added. Mandatory SI tables are added automatically. The structure of the carousel can be saved in XML format; this definition file can be subsequently reopened in a new session for further edits.

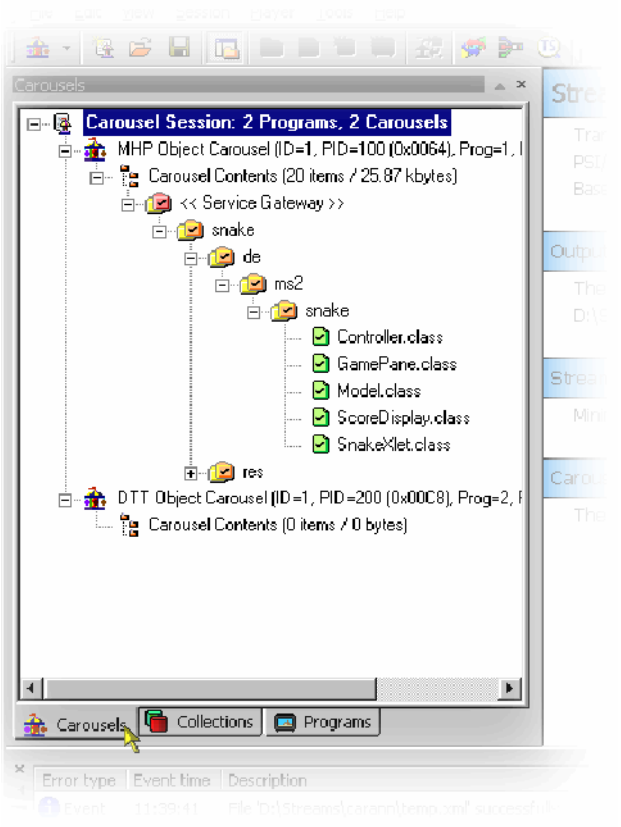
The end result of a session is the creation of a transport stream, which can be saved to a file.

One of the main advantages of Carousel Generator is that many of the more complex concepts in the various Object Carousel standards are hidden from the user for the sake of clarity and user friendliness.

Three views of the assembled stream are offered: Carousels, Collections and Programs. Each view displays aspects of the stream from a single perspective. The three following screenshots show the same stream in each of the views.

Carousels View

The Carousels view lists the carousels and the associated objects that are included in the session.



Carousel Types. The supported carousel types are as follows:

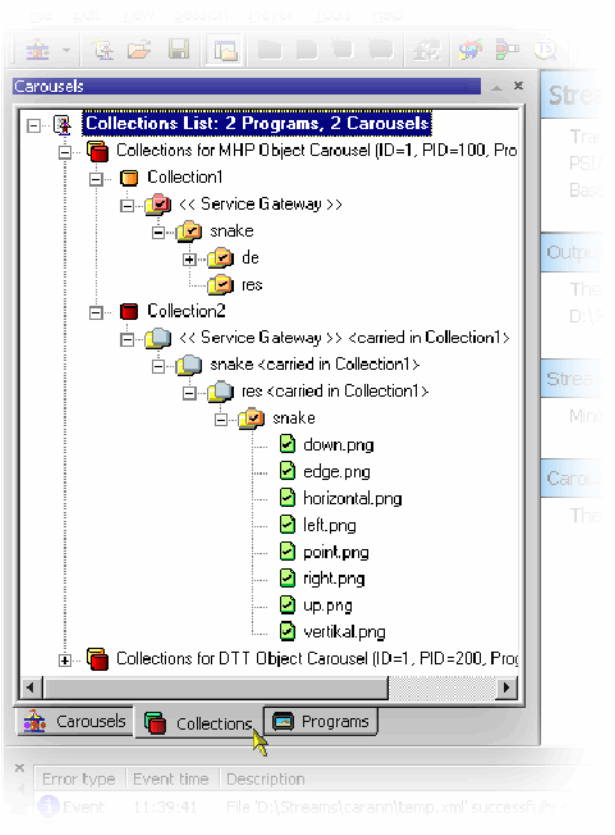
Object Carousels: DSMCC, DVB, DTT, MHP

Object carousels	Reference specification
DSM-CC	Digital Storage Media - Command and Control (MPEG only)
DVB	Digital Video Broadcast
DTT	Digital Terrestrial Television
MHP	Multimedia Home Platform

The type of carousel being edited dictates the available options and user interface elements.

Collections View

Objects associated with a carousel can be grouped together in collections. The properties of each collection can be adjusted to give the most efficient delivery in the transport stream.

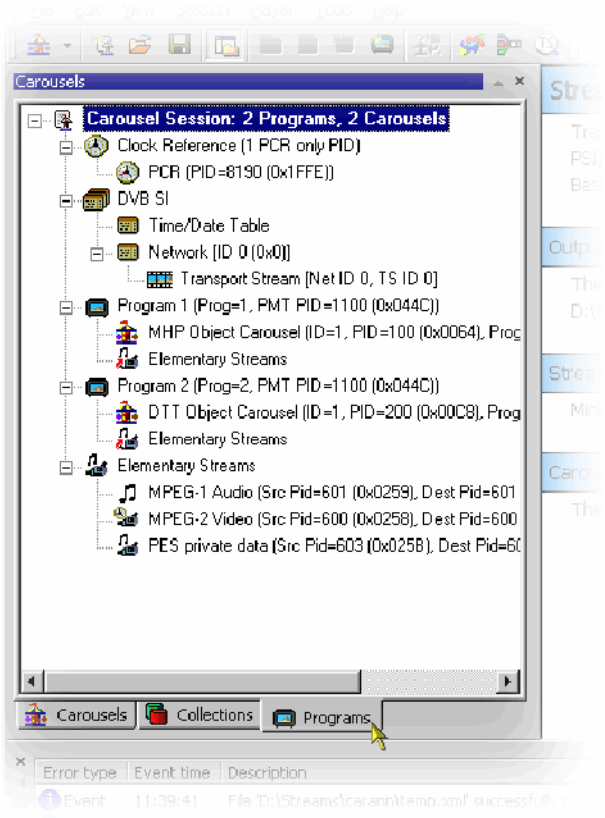


The way that individual objects in a carousel are to be transmitted often varies. Each object in the carousel has properties including its minimum repetition rate (maximum cycle time) and whether it is compressed. Files that need to be transmitted with similar properties or which are logically related can be grouped into a module. As the DSMCC module is a limited size, the process of adding an object to a module would require calculating whether the object would fit into the module's available space (possibly after compression) and if no space is available, generating a new module and feeding this back to the user. This would slow this aspect of the user interface down appreciably.

Consequently, the concept of a collection is used to replace the size-limited DSMCC module, with a "module of unlimited size". Any number of objects can be added to a collection; during stream generation, this may translate to many modules with the same properties.

Programs View

In the Program view, the root is the Carousel Session (as in the other views). Immediately below this are nodes giving access to the supported (mandatory) SI/PSI tables and a listing of PCR PIDs. There is also an Elementary Streams node, which lists all of the imported elementary streams included in the stream and the Program nodes, which show the allocation of carousels and elementary streams to programs.



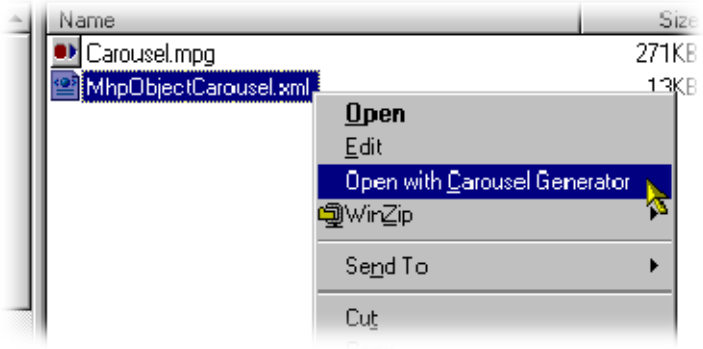
Carousel Definition File

The current state of the Carousel Generator session can be saved to disk at any time during the creation process, using the carousel definition file. The format of the saved file is standard XML and can be viewed in any XML compatible viewer (for example, Internet Explorer 5 and up); editing the XML file directly is not recommended.

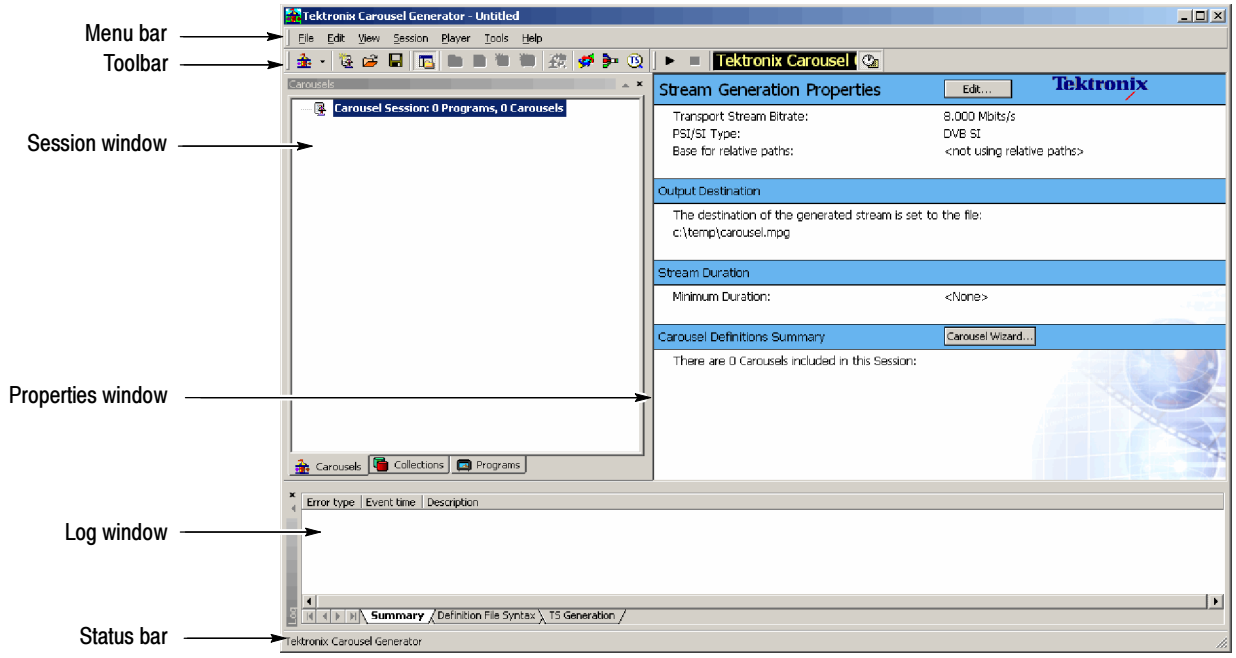
Starting the Application

The application can be started by selecting the **Carousel Generator** option from the **Start > Programs** menu or by double-clicking the **Carousel Generator** shortcut on the desktop.

In addition, files with an XML extension have an additional option in the right-click menu (**Open with Carousel Generator**). When this option is selected, Carousel Generator opens and attempts to use the file as a *Carousel Definition file* (see page 7-5).



Initial Appearance



The full range of options available to the Carousel Generator can be accessed by using the Menu Bar. However, the selection of options varies during the stages of carousel creation; unavailable options are normally grayed out. The Toolbar provides shortcuts to the more common options.

The working area of the Carousel Generator screen contains three windows: the Session window, the Properties window and the Log window. The Session window and the Log window can each be either floated (moved to anywhere on the desktop) or docked to one of the four sides of the application window. The content of the Properties window is context-sensitive; it will provide a summary of the properties of the node highlighted in the Session window.

A full description of the Carousel Generator screen components can be found in the *Menus and Controls*, page 7–40.

Session Window. The Session window is the workspace in which carousels and collections are built and manipulated. The window has three tabs: Carousels, Collections and Programs. Each window displays different aspects of the current session in the form of a tree structure.

Carousel Tab — The Carousels Session window displays all of the carousels in the current session and the directories and files associated with each carousel. It is in this window that carousels are built and manipulated.

Collections Tab — The Collections Session window displays the collections associated with each carousel and the allocation of files and directories within them.

Programs Tab — The Program session window displays the contents of the stream from the program or service point of view.

Properties Window. The Properties window provides an immediate view of the parameters and values associated with each node in the Carousels and Collections Session windows. The values displayed are those of the currently selected node.

Log Window. The Log window displays errors and warnings as the carousel building and stream generation progresses.

A full description of the Carousel Generator screen components can be found in the *Menus and Controls*, page 7–23.

Carousel Wizard

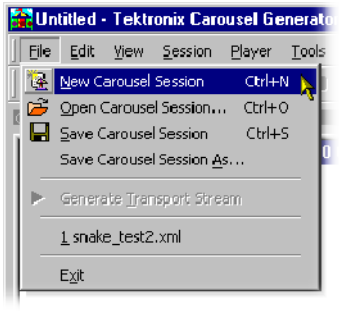
The Carousel Wizard makes the process of creating a single carousel easier. The carousel is added to the current session. The final step of the wizard allows a transport stream to be created using the information in the current session.

Default parameters are provided at all stages of the wizard, but the user can change them either in the wizard screens or subsequently in the various property dialog boxes.

The description in this section provides an overview of the wizard and carousel creation. Individual properties and activities are described in more detail in the *Reference* section. Extensive tooltips are provided with the wizard screens. Place the cursor over any element of a screen to reveal the tooltip.

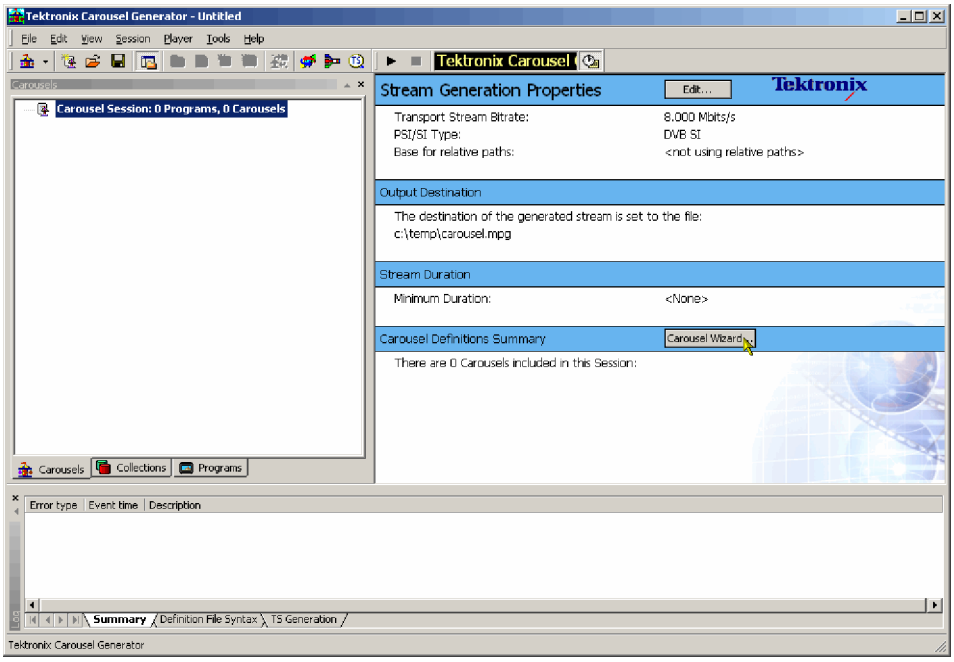
If a carousel session is in progress, the user must decide whether a new session is required or a new carousel is to be added to an existing session.

To start a new carousel session, select **File > New Carousel Session**.



Any open carousel session will be closed with an option to save.

The following screen is displayed:

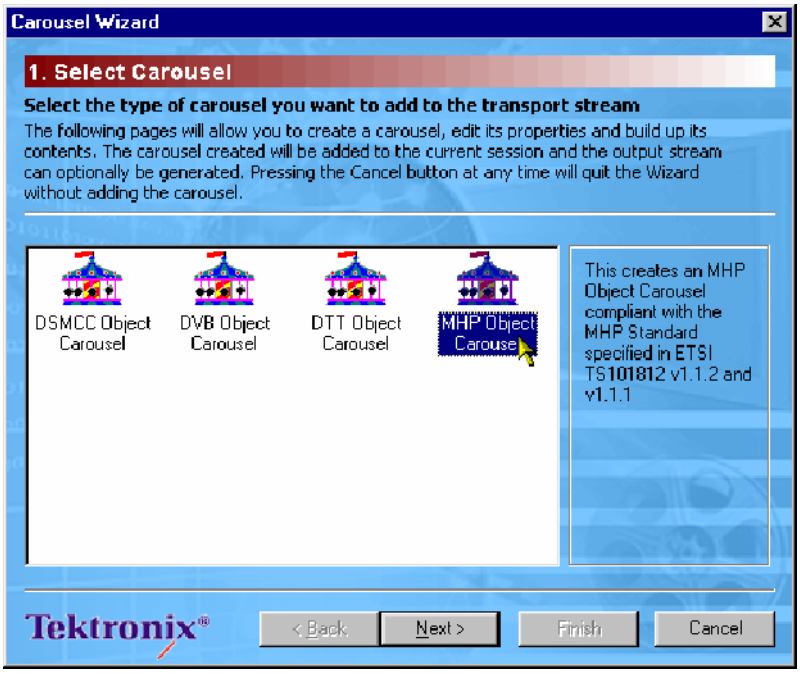


For a new session or adding a carousel to an existing session, the wizard can now be invoked.

Step 1: Select Carousel

1. In the work area select Carousel Wizard… or select **Session > Carousel Wizard**.

   Step 1: Select Carousel of the Carousel Wizard is displayed.

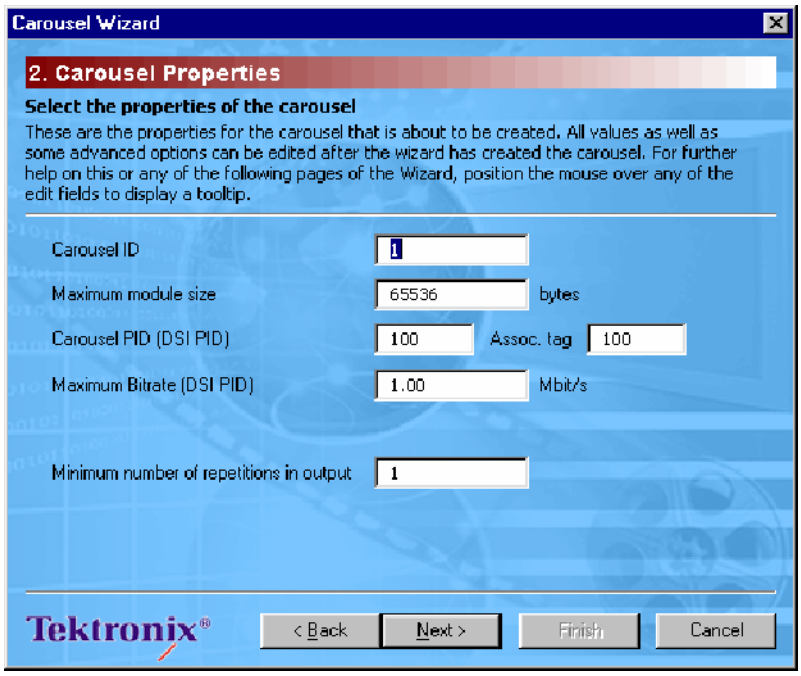

Carousel Wizard
1. Select Carousel
Select the type of carousel you want to add to the transport stream
The following pages will allow you to create a carousel, edit its properties and build up its contents. The carousel created will be added to the current session and the output stream can optionally be generated. Pressing the Cancel button at any time will quit the Wizard without adding the carousel.
DSMCC Object Carousel
DVB Object Carousel
DTT Object Carousel
MHP Object Carouse
This creates an MHP Object Carousel compliant with the MHP Standard specified in ETSI TS101812 v1.1.2 and v1.1.1
Tektronix
< Back
Next >
Finish
Cancel

2. Highlight the required Carousel type.

   Note that depending on the type selected, some of the subsequent wizard screens will vary in content. The content is dictated by the carousel type selected.

3. Select Next to display *Step 2: Carousel Properties*.

Step 2: Carousel Properties


Carousel Wizard
2. Carousel Properties
Select the properties of the carousel
These are the properties for the carousel that is about to be created. All values as well as some advanced options can be edited after the wizard has created the carousel. For further help on this or any of the following pages of the Wizard, position the mouse over any of the edit fields to display a tooltip.
Carousel ID
1
Maximum module size
65536
bytes
Carousel PID (DSI PID)
100
Assoc. tag
100
Maximum Bitrate (DSI PID)
1.00
Mbit/s
Minimum number of repetitions in output
1
Tektronix®
< Back
Next >
Finish
Cancel

In Step 2, the Carousel Properties are selected. Defaults are supplied but all properties can be edited. Properties can also be edited after the carousel has been created from the main window.

4. Make any required adjustments to the Carousel properties.

5. Select how many times the carousel should appear in the output stream.

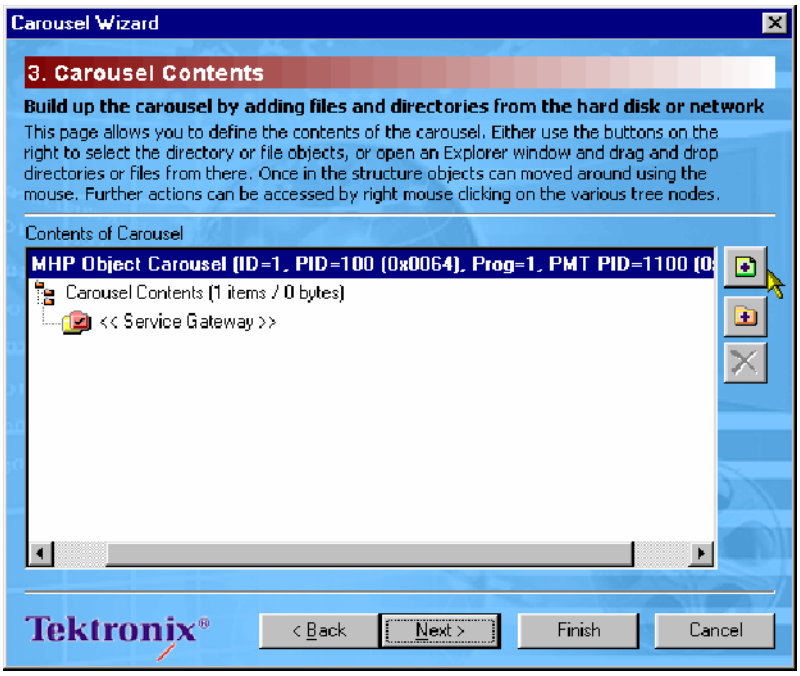
***NOTE**. When using the wizard, only a single carousel is being assembled. However, more than one carousel may be created within a session.*

The number of repetitions can be specified for each carousel. The length of the transport stream will be dictated by the carousel that requires the longest time by virtue of its size or the number of requested repetitions . Carousels in the same session requiring less time to fulfill their size/repetition criteria will be repeated.

---

6. Select Next to display *Step 3: Carousel Contents*.

Step 3: Carousel Contents


Carousel Wizard
3. Carousel Contents
Build up the carousel by adding files and directories from the hard disk or network
This page allows you to define the contents of the carousel. Either use the buttons on the right to select the directory or file objects, or open an Explorer window and drag and drop directories or files from there. Once in the structure objects can moved around using the mouse. Further actions can be accessed by right mouse clicking on the various tree nodes.
Contents of Carousel
MHP Object Carousel (ID=1, PID=100 (0x0064), Prog=1, PMT PID=1100 (0
Carousel Contents (1 items / 0 bytes)
<< Service Gateway >>
Tektronix
< Back
Next >
Finish
Cancel

Files and directories containing applications and resources are added to the carousel during this step.

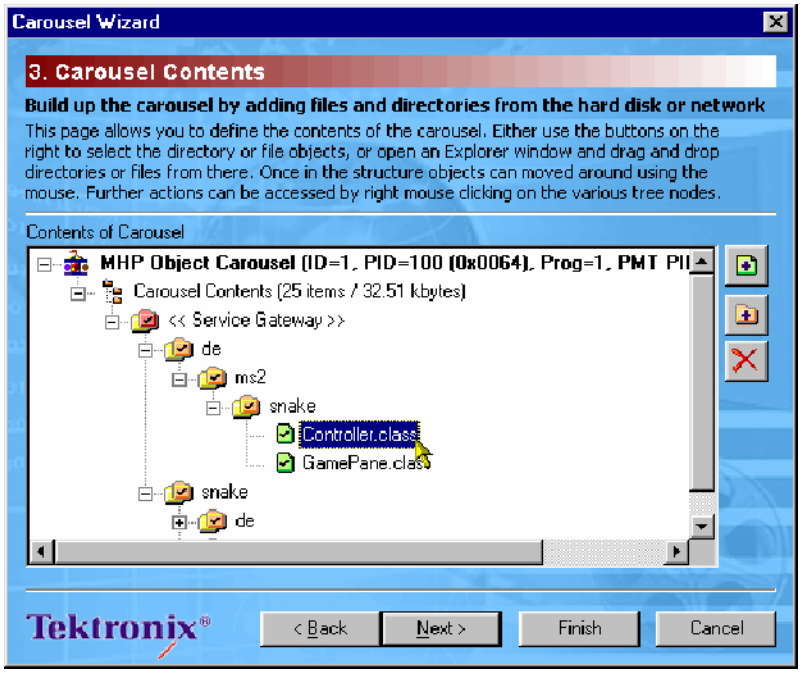
The buttons on the right side of the window allow individual files or complete directory structures to be added to highlighted nodes of the carousel. Files and directories can also be dragged and dropped from Windows Explorer.

Add files: Add directories:

Files and directories can be dragged and dropped within the wizard window, to allow final adjustments to be made.

Highlighted files and directories can be also be deleted .

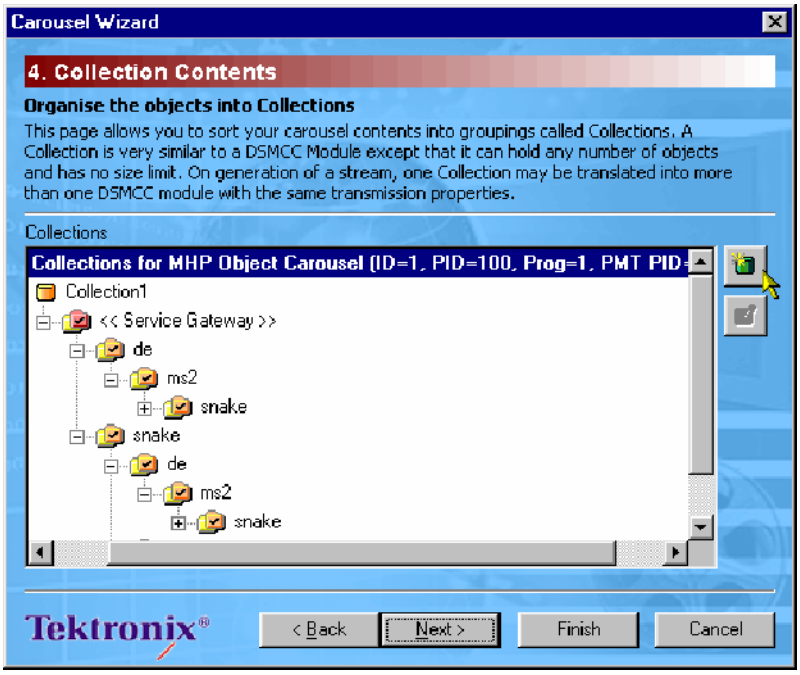
7. Build the carousel structure as required.


Carousel Wizard
3. Carousel Contents
Build up the carousel by adding files and directories from the hard disk or network
This page allows you to define the contents of the carousel. Either use the buttons on the right to select the directory or file objects, or open an Explorer window and drag and drop directories or files from there. Once in the structure objects can moved around using the mouse. Further actions can be accessed by right mouse clicking on the various tree nodes.
Contents of Carousel
MHP Object Carousel (ID=1, PID=100 (0x0064), Prog=1, PMT PI
Carousel Contents (25 items / 32.51 kbytes)
<< Service Gateway >>
de
ms2
snake
Controller.class
GamePane.class
snake
de
Tektronix
< Back
Next >
Finish
Cancel

Highlighting an object and selecting Properties from the right-click menu allows access to the object properties.

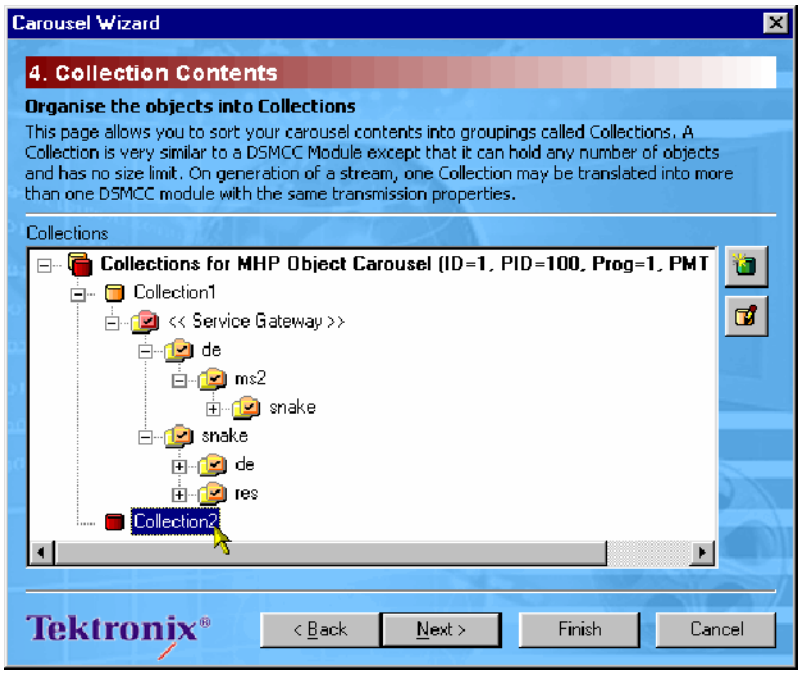
8. Select Next to display *Step 4: Collection Contents*.

Step 4: Collection Contents


Carousel Wizard
4. Collection Contents
Organise the objects into Collections
This page allows you to sort your carousel contents into groupings called Collections. A Collection is very similar to a DSMCC Module except that it can hold any number of objects and has no size limit. On generation of a stream, one Collection may be translated into more than one DSMCC module with the same transmission properties.
Collections
Collections for MHP Object Carousel (ID=1, PID=100, Prog=1, PMT PID=
Collection1
<< Service Gateway >>
de
ms2
snake
snake
de
ms2
snake
Tektronix
< Back
Next >
Finish
Cancel

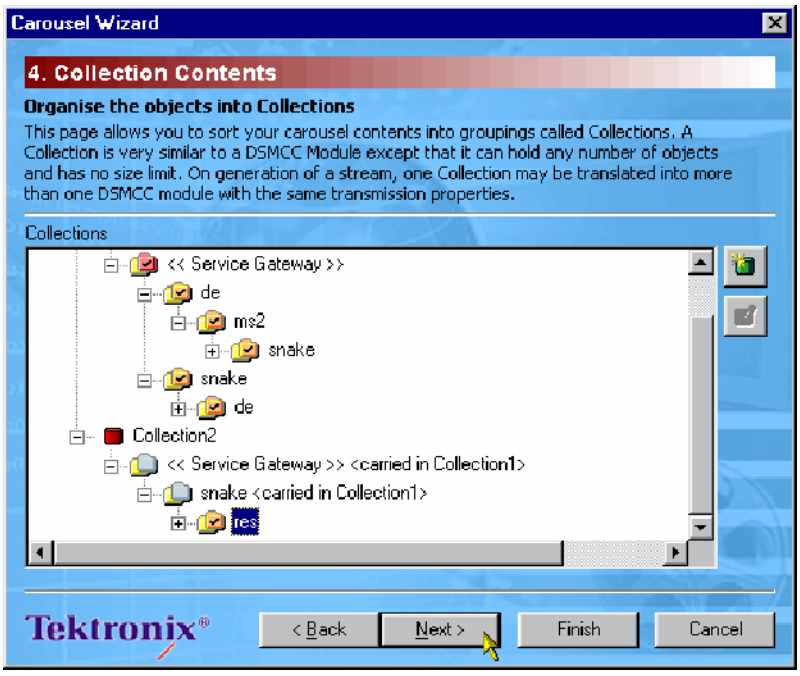
The files added in the previous step are automatically placed in a single default Collection (as shown above). Collections allow objects to share transmission properties including minimum repetition rate (maximum cycle time) and compression. This step allows the user to change the properties of the default Collection, create new Collections, and move files between the various collections.

9. Select to create a new collection header.


Carousel Wizard
4. Collection Contents
Organise the objects into Collections
This page allows you to sort your carousel contents into groupings called Collections. A Collection is very similar to a DSMCC Module except that it can hold any number of objects and has no size limit. On generation of a stream, one Collection may be translated into more than one DSMCC module with the same transmission properties.
Collections
Collections for MHP Object Carousel (ID=1, PID=100, Prog=1, PMT
Collection1
<< Service Gateway >>
de
ms2
snake
snake
de
res
Collection2
Tektronix
< Back
Next >
Finish
Cancel

10. Highlight a collection node and select to modify the collection's properties.

***NOTE**. If the previous wizard step is reselected (Back) and more files added or removed, the Collection assignment is maintained for existing files and new files are placed in the parent directory's collection by default.*

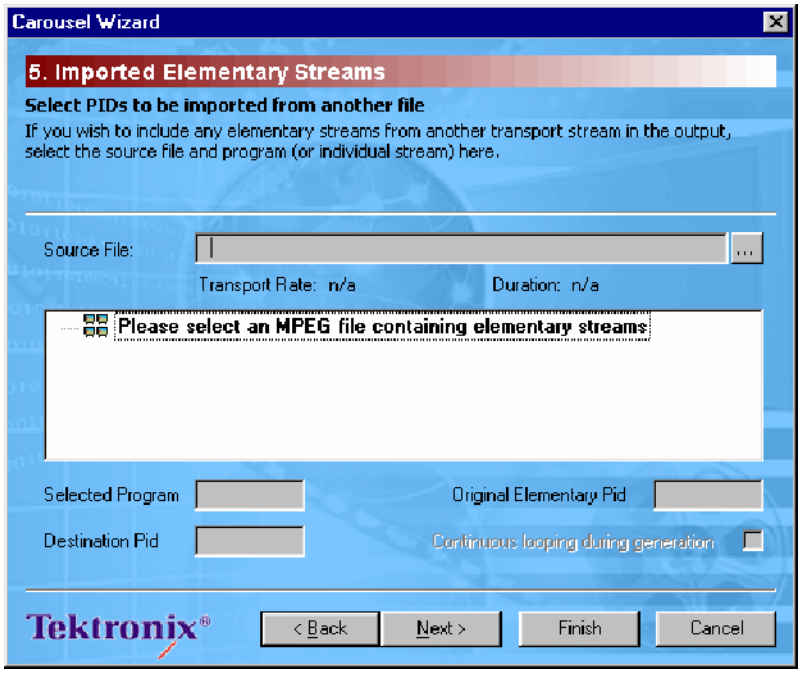


To modify the collection properties, highlight the required Collection node and select Properties from the right-click menu.

11. Select Next to display *Step 5: Imported Elementary Streams*.

Step 5: Imported Elementary Streams

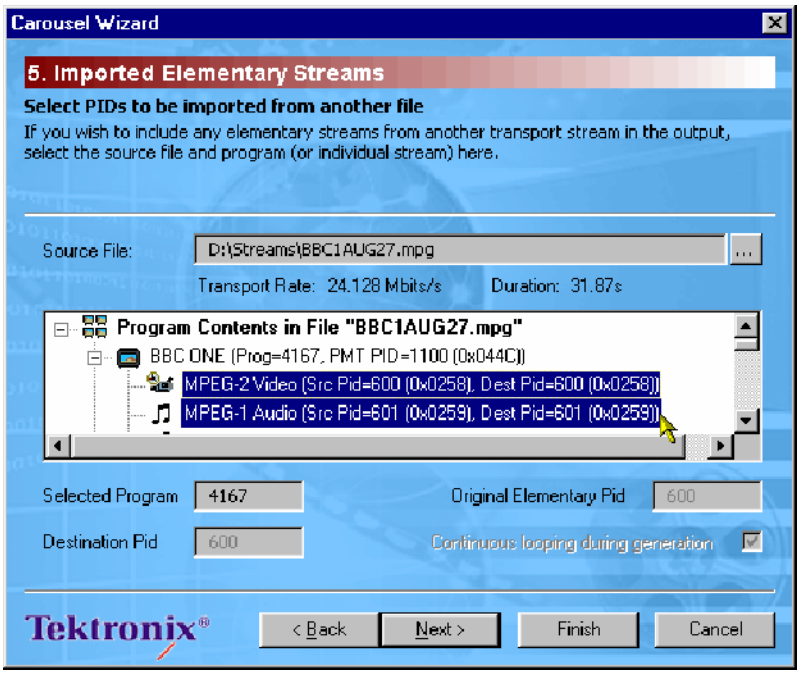
In addition to the carousel objects, elementary streams from a transport stream can be included in the session.


Carousel Wizard
5. Imported Elementary Streams
Select PIDs to be imported from another file
If you wish to include any elementary streams from another transport stream in the output, select the source file and program (or individual stream) here.
Source File:
Transport Rate: n/a
Duration: n/a
Please select an MPEG file containing elementary streams
Selected Program
Original Elementary Pid
Destination Pid
Continuous looping during generation
Tektronix
< Back
Next >
Finish
Cancel

12. Use the Source File: button to identify and select the transport stream.

The contents of the source file are displayed.

13. Select one or more elements from this tree to import into the current session, or select a program node to import every element contained by the program.


Carousel Wizard
5. Imported Elementary Streams
Select PIDs to be imported from another file
If you wish to include any elementary streams from another transport stream in the output, select the source file and program (or individual stream) here.
Source File:
D:\Streams\BBC1AUG27.mpg
Transport Rate: 24.128 Mbits/s
Duration: 31.87s
Program Contents in File "BBC1AUG27.mpg"
BBC ONE (Prog=4167, PMT PID=1100 (0x044C))
MPEG-2 Video (Src Pid=600 (0x0258), Dest Pid=600 (0x0258))
MPEG-1 Audio (Src Pid=601 (0x0259), Dest Pid=601 (0x0259))
Selected Program
4167
Original Elementary Pid
600
Destination Pid
600
Continuous looping during generation
Tektronix
< Back
Next >
Finish
Cancel

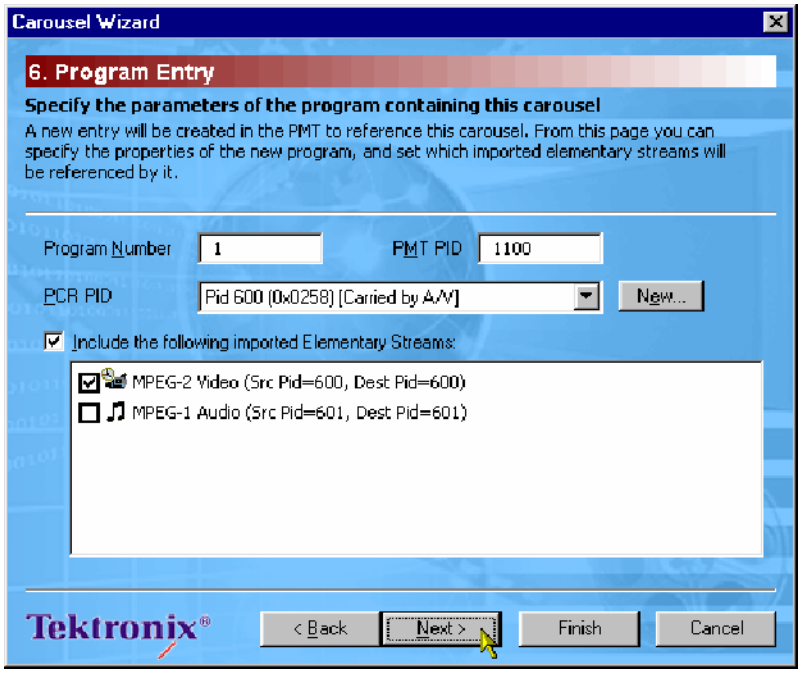
Note that only elements from the same source program can be selected. All elements included in the session will be included in the output stream, whether they are referenced by a program or not.

Where possible, elementary streams will be carried on the same PID used in the source stream; where a conflict within the session occurs, a new PID will be automatically allocated or can be allocated manually.

14. Having identified the source stream and the individual elementary streams to be included in the session, select Next to display *Step 6: Program Entry.*

Step 6: Program Entry

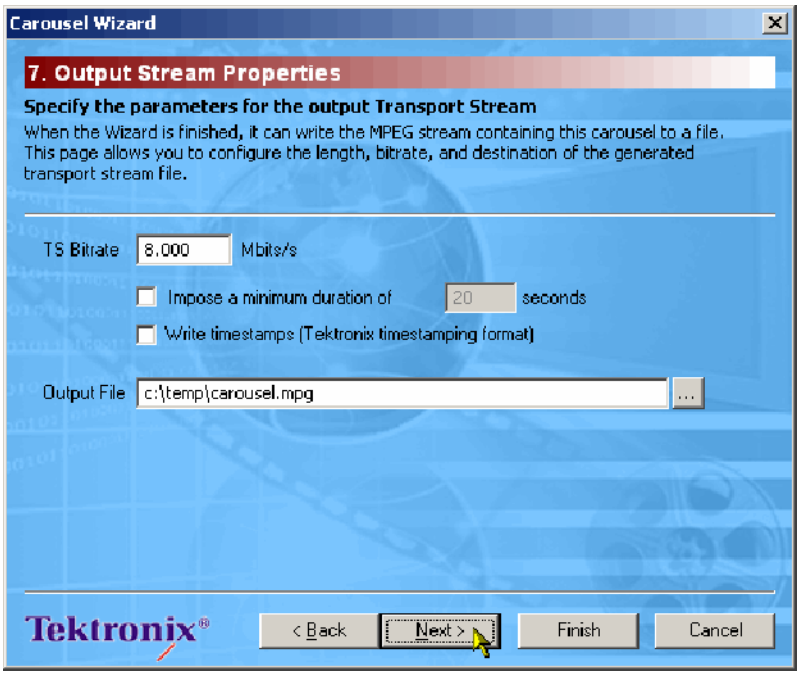
At this step, a new entry will be created in the PMT referencing this carousel. Also, the elementary streams identified in the previous steps can be associated with a new program.


Carousel Wizard
6. Program Entry
Specify the parameters of the program containing this carousel
A new entry will be created in the PMT to reference this carousel. From this page you can specify the properties of the new program, and set which imported elementary streams will be referenced by it.
Program Number
1
PMT PID
1100
PCR PID
Pid 600 (0x0258) [Carried by A/V]
New...
Include the following imported Elementary Streams:
MPEG-2 Video (Src Pid=600, Dest Pid=600)
MPEG-1 Audio (Src Pid=601, Dest Pid=601)
Tektronix
< Back
Next >
Finish
Cancel

15. Select the elementary streams to be included in the new program.

16. Select Next to display *Step 7: Output Stream Properties*.

Step 7: Output Stream Properties


Carousel Wizard
7. Output Stream Properties
Specify the parameters for the output Transport Stream
When the Wizard is finished, it can write the MPEG stream containing this carousel to a file. This page allows you to configure the length, bitrate, and destination of the generated transport stream file.
TS Bitrate
8.000
Mbits/s
Impose a minimum duration of
20
seconds
Write timestamps (Tektronix timestamping format)
Output File
c:\temp\carousel.mpg
Tektronix
< Back
Next >
Finish
Cancel

Use this screen to specify the name and properties of the transport stream that is to be created.

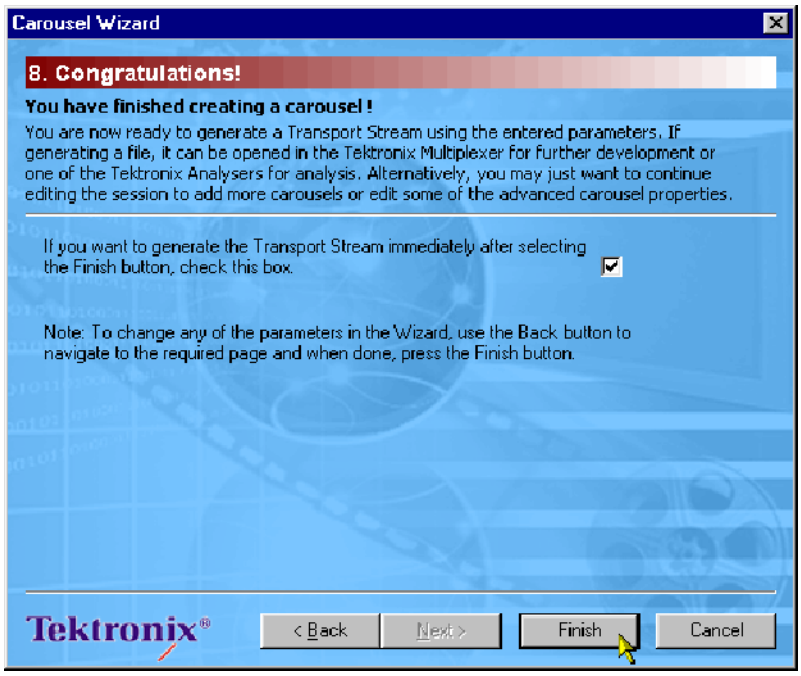
17. Enter the TS Bitrate.

18. Enter minimum duration for the output transport stream if required.

19. Enter or select (...) an Output File name.

20. Select Next to display *Step 8: Congratulations*.

Step 8: Congratulations


Carousel Wizard
8. Congratulations!
You have finished creating a carousel !
You are now ready to generate a Transport Stream using the entered parameters. If generating a file, it can be opened in the Tektronix Multiplexer for further development or one of the Tektronix Analysers for analysis. Alternatively, you may just want to continue editing the session to add more carousels or edit some of the advanced carousel properties.
If you want to generate the Transport Stream immediately after selecting the Finish button, check this box.
Note: To change any of the parameters in the Wizard, use the Back button to navigate to the required page and when done, press the Finish button.
Tektronix®
< Back
Next >
Finish
Cancel

The carousel is now prepared. If the option to create the transport stream is enabled, then all carousels in the current session will be included. The carousel created with the wizard will be added to the session screen.

21. Select **Finish** to exit the wizard.

Menus and Controls

The following pages contain descriptions of different menu options, toolbar controls, status bar, log window, and properties window.

Menus Options

The following pages describe all of the menu options. Since many of the options are context sensitive, they will be available only when their function is appropriate for the selected window or display element. When a menu option is not available, the option is grayed out.

File Menu Options

Table 7-1: File menu options

Option	Function
New Carousel Session	Opens a new carousel session. An opportunity to save the current session is offered, if relevant.
Open Carousel Session…	Opens an existing carousel session using a saved carousel definition file.
Save Carousel Session	Saves the current carousel session in the form of a carousel definition file. If the file has not been saved, an opportunity is offered to name it.
Save Carousel Session As…	Allows the current carousel session to be named and saved in the form of a carousel definition file.
Most Recently Used List	Lists the most recently used carousel session files. Click on a file name to reopen it. The number of files displayed is set in the Carousel Generator Options dialog box (**Tools** > **Options**).
Exit	Closes the application. An opportunity is offered to save the session if it has not been saved.

Edit Menu Options

Table 7-2: Edit menu options

Option	Function
Cut	Cuts the currently highlighted item. The item is stored on the Windows clipboard.
Copy	Copies the currently highlighted item. The item is stored on the Windows clipboard.
Paste	Paste the item currently on the Windows clipboard.
Empty Carousel	(Carousel contents node highlighted.) Deletes the carousel contents.
Delete Collections	(Collection node highlighted.) Deletes the selected collection (The Collection must be empty; the contents must be moved to another collection first).
Delete Program	(Program node highlighted.) Deletes the selected program and the carousel(s) it contains.

View Menu Options

Table 7-3: View menu options

Option	Function
MHP Applications	List MHP applications where they are included in a session.
Carousels; Log; Generator Toolbar; Player Toolbar; Status Bar	Allows the screen elements listed to be shown or hidden.

Session Menu Options

Table 7-4: Session menu options

Option	Function
New Program…	(Program view.) Adds a new program node.
Import Elementary Stream(s)…	(Program view.) Allows elementary streams to be added to the Elementary Streams node.
New Carousel	(Carousel view or Program node.) Allows a new carousel type to be created.
Carousel Wizard	Opens the Carousel Wizard which takes the user through carousel and stream generation step-by-step.
Carousel Properties…	Opens the Carousel Properties dialog box.
Contents	Facilitates the file activities listed below (the menu content is context sensitive): Empty Carousel Empty currently highlighted carousel.
	Delete Object Deletes currently highlighted object (and dependant objects). Add File(s)… Adds one or more files to the selected carousel. Add Directory… Adds a directory to the selected carousel. New Directory… Creates a new directory at the selected node. Move to Collection Moves the selected objects to another collection. HTML Application commands Makes, Removes, and Edits HTML applications. Java Application commands Makes, Removes, and Edits Java applications. These HTML and Java Application commands are only applicable to file objects (when a file is selected).
Synchronize	Synchronizes the carousel contents with the source files.
Delete Carousel	Deletes the selected carousel.
Delete All Carousels	Deletes all carousels in the current session.

Player Menu Options

Table 7-5: Player menu options

Option	Function
Stream Generation Properties…	Opens the Stream Generation Properties dialog box.
Start Playout	Initiates output stream generation using information in the current session.
Stop Playout	Stops output generation.
View Packets/Time	Switches between packet count and time display during playout.

Tools Menu Options

Table 7-6: Tools menu options

Option	Function
Launch Multiplexer	Opens the Multiplexer application.
Launch Carousel Analyzer	Opens the Carousel Analyzer application.
Launch TS Analyzer	Opens the Transport Stream Analyzer application.
Options…	Opens the Carousel Generator options dialog box. This is used to set the basic Carousel Generator and session defaults.

Help Menu Options

Table 7-7: Help menu options

Option	Function
Quick Help	Opens an HTML help page containing summarized help information.
User Guide	Opens the Carousel Generator User Guide in Adobe Acrobat™ (PDF) format.
About Carousel Generator…	Displays information about Carousel Generator, including Software Version and Serial Number.

Toolbars

Two toolbars can be displayed: Generator and Player. The toolbars can be shown or hidden using the View menu or by right-clicking in the toolbar area.

Toolbars provide a set of convenient shortcuts for the more frequently used menu options. The buttons are context-sensitive and are enabled or disabled dependent upon the currently highlighted view or the action being performed.

Generator Toolbar

Table 7-8: Generator toolbar icons

Icon	Function	Equivalent Menu Bar Command
	Carousel wizard	Session > Carousel Wizard (Ctrl+W)
	New carousel session	File > New Carousel Session (Ctrl+N)
	Open carousel session	File > Open Carousel Session (Ctrl+O)
	Save carousel session	File > Save Carousel Session (Ctrl+S)
	Toggle workspace view	View > Carousels
	Add directory	Session > Contents > Add Directory…
	Add files	Session > Contents > Add Files…
	New collection	(Right-click on Collection node) > New Collection
	Insert program	Session > New Program…
	Synchronize carousel	Session > Synchronise…
	Launch Carousel Analyzer	Tools > Launch Carousel Analyzer
	Launch Multiplexer	Tools > Launch Multiplexer
	Launch Transport Stream Analyzer	Tools > Launch TS Analyzer

Player Toolbar

Table 7-9: Player toolbar icons

Icon	Function	Equivalent Menu Bar Command
▶	Playout Carousel	Player > Start Playout
■	Stop playout	Player > Stop Playout
000000000000 0000:00:00.000	Toggle Packet/Time display	Player > View Packets/Time

Toolbars can be dragged off the edge of the main window into a floating pallet. To do this, place the mouse pointer on the background inside the Toolbar, (not on one of the buttons), hold the left button down, and drag the toolbar into the main window area. The result is a self-contained window that looks like this:

To replace the Toolbar on the window border, drag it over the border until the outline changes shape. It can be placed on the top, bottom, left or right edge.

The Toolbar may be hidden from view - **View** > **Toolbar**.

Icons. The icons in Session windows are used to provide the user with a graphical indication of status.

Icons incorporating an arrow indicate a shortcut function; for example, elementary streams displayed in a Program node in the Programs view indicate a shortcut to the elementary stream in the Elementary Streams node.

Table 7-10: Session icons

Icon	Function
	Collections node
	Collection node containing the Service Gateway. At least one collection must exist during any session. The collection containing the Service Gateway cannot be deleted.
	Ordinary collection node. Not containing Service Gateway.
	Compressed collection.
	Directory object Included in Carousel; Included in Synchronization.
	Directory object Included in Carousel; Not included in Synchronization.
	Directory object Not included in Carousel; Included in Synchronization.
	Directory object shared.
	File object Included in Carousel.
	File object Not included in Carousel.
	PCR node
	DVB SI / MPEG PSI
	Table node
	Transport Stream node
	Program node
	Carousel object
	Elementary Stream - Audio

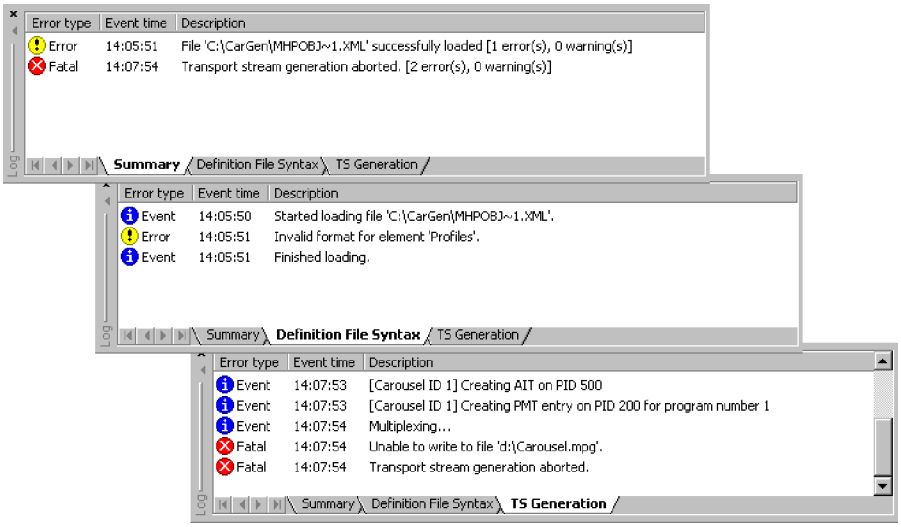
Table 7-10: Session icons (Cont.)

Icon	Function
	Elementary Stream - Video
	Elementary Stream - Private data

Log Window

The Log Window contains three tabbed views:

- The **Summary** log records information on the general activities in the Carousel Generator.
- The **Definition File Syntax** log records information on activities concerning the definition file.
- The **TS Generation** log records information during stream generation activities.


Error type
Event time
Description
Error 14:05:51 File 'C:\CarGen\MHPOBJ~1.XML' successfully loaded [1 error(s), 0 warning(s)]
Fatal 14:07:54 Transport stream generation aborted. [2 error(s), 0 warning(s)]
Summary
Definition File Syntax
TS Generation
Event 14:05:50 Started loading file 'C:\CarGen\MHPOBJ~1.XML'.
Error 14:05:51 Invalid format for element 'Profiles'.
Event 14:05:51 Finished loading.
Event 14:07:53 [Carousel ID 1] Creating AIT on PID 500
Event 14:07:53 [Carousel ID 1] Creating PMT entry on PID 200 for program number 1
Event 14:07:54 Multiplexing...
Fatal 14:07:54 Unable to write to file 'd:\Carousel.mpg'.
Fatal 14:07:54 Transport stream generation aborted.

During file loading and saving and the generation of transport streams, error messages are routed to the appropriate Log window tab. More information about each error can be accessed by clicking on the error entry or selecting the **Details**… option from the right-click menu.

The following icons are used to indicate the severity of the error:

(Blue)	Event	Indicates normal processing activity.
(Gray)	Warning	Indicates that information was not available or was invalid. The operation will often be completed.
(Yellow)	Error	Indicates that a sub-operation could not be completed; the overall task may still be completed.
(Red)	Fatal	Indicates that a fatal error has occurred; an activity has failed to reach completion.

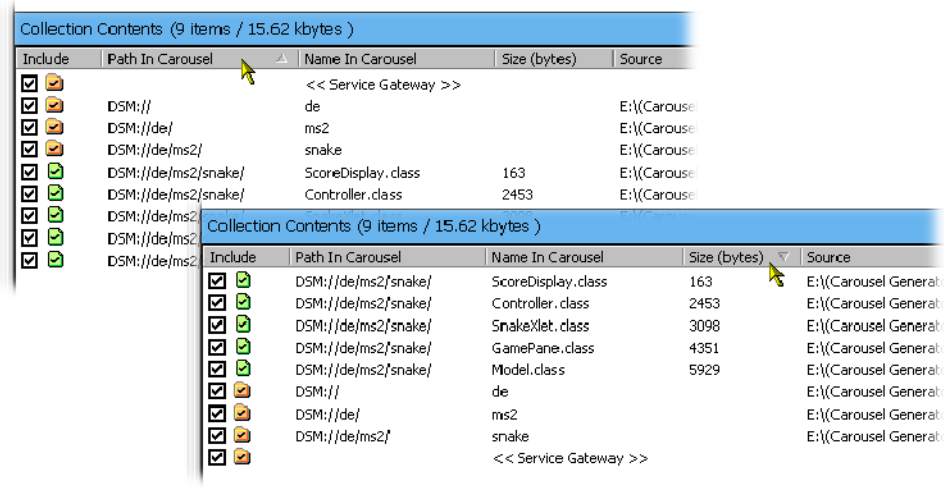
A right-click menu allows the user to clear the displayed log or all logs.

Status Bar

The Status Bar displays tool-tips when the mouse pointer is over active elements of the window, for example, toolbar buttons and menu options.

Properties Window (List Control)

In properties windows that display lists (for example, contents lists), one column can be selected to sort the list into ascending or descending order.



To sort a list, click the key column header. If the same column needs to be sorted in reverse order, click the header again; note that the arrow icon in the header bar indications the sort direction.

Carousel Generation

This section describes the processes required to create a transport stream containing one or more carousels. In broad terms it echoes the steps outlined in the Wizard, but more background information is provided.

Setting Overall Carousel Generator Properties

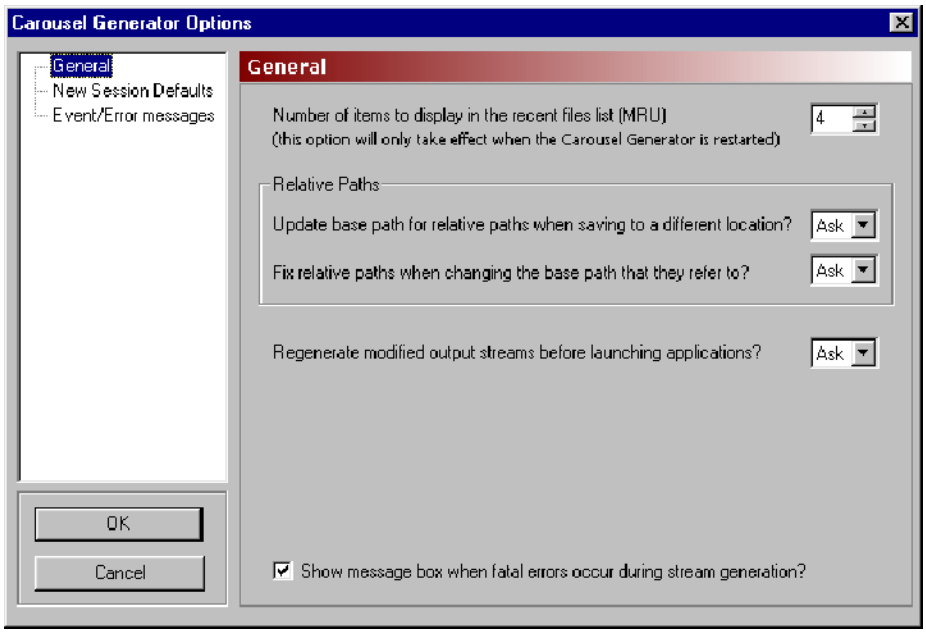
Although not essential during every session, the general properties of the Carousel Generator can be set using the Carousel Generator Options dialog box. Note that settings such as the Output Filename can be overridden in the current session; however, the settings made here will be used as the defaults in any new session.

Select **Tools > Options**… to open the Carousel Generator Options dialog box.

Carousel Generator Options

The following screens are available in this dialog box: **General**, **New Session Defaults** and **Event/Error messages**. To view a screen, click the name in the left panel.

General screen


Carousel Generator Options
General
New Session Defaults
Event/Error messages
General
Number of items to display in the recent files list (MRU)
(this option will only take effect when the Carousel Generator is restarted)
4
Relative Paths
Update base path for relative paths when saving to a different location?
Ask
Fix relative paths when changing the base path that they refer to?
Ask
Regenerate modified output streams before launching applications?
Ask
OK
Cancel
Show message box when fatal errors occur during stream generation?

Number of items…
A list of the most recently used carousel definition files is displayed in the **File** menu. Use this parameter to select how many file names should be displayed.
Range: 0 to 15

Relative Paths
The paths of source components associated with a carousel file can be stored in relative or absolute format.

Update base path…
When a carousel definition is saved to a different (new) location, components stored with paths relative to the original carousel definition may no longer be found at the same (relative) location. If **Yes** is selected from the drop-down list, the base path will be modified so that the components can still be found. Select **Ask** to allow the user to make a decision when the carousel definition is saved. If **No** is selected, no modification will be made to the base path; carousel components may no longer be accessible to the definition file.

Fix relative paths…
When the base path for components referenced by a carousel definition file is changed, the existing relative paths may not refer to the correct locations. If **Yes** is selected from the drop-down list, the relative paths will be adjusted so that they are referenced correctly to the new base path.

Regenerate…

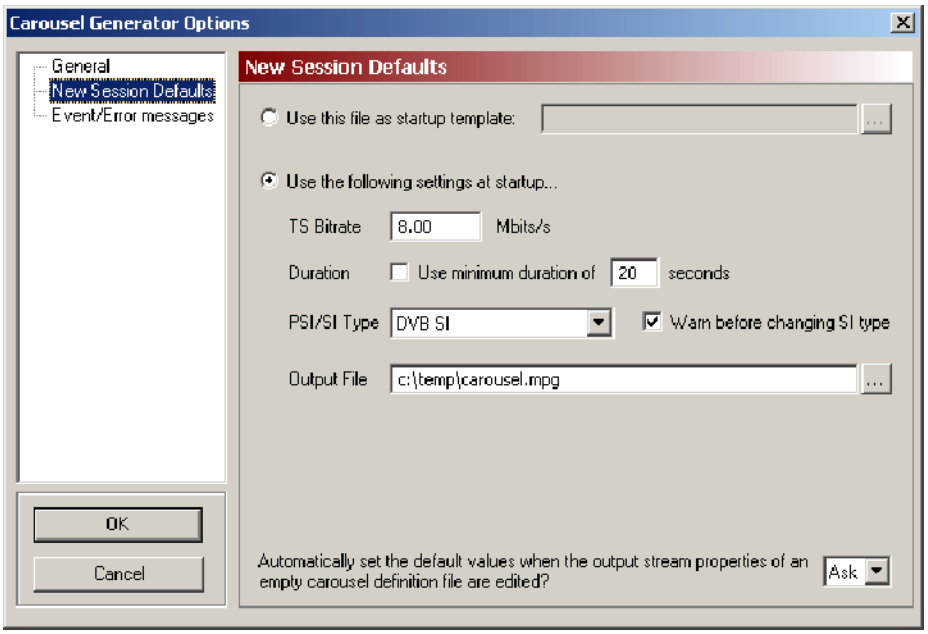
When enabled, launching Carousel Analyzer, Transport Analyzer or Multiplexer causes the output stream to be regenerated using the current session properties. This ensures that the properties that have been entered in the Carousel Generator are the same as those shown in the Carousel Analyzer, Transport Analyzer or Multiplexer.

Show message…

When enabled, a message will be displayed during stream generation if an error occurs which causes the stream generation to terminate. The error will always be reported in the TS Generation tab of the Log window.

New Session Defaults screen

This screen provides default values to be used for all new sessions and consequently in the carousel definition files and generated transport streams. The default values can originate from a template or be set individually. The values can be overridden in individual carousel sessions.



Startup Template

Select this option and identify a file to be used as a start-up template.

Any carousel session file (XML format) can be used as a template. It can be used primarily to retain settings which are required from session to session, for example, network settings.

Startup Settings. Select the **Use the following settings**… option to set the session defaults locally.

TS Bitrate: The bit rate of the output transport stream.
Range: 0.25 Mbit/s to 90 Mbit/s

Duration: The duration value (in seconds) available when this feature is enabled will dictate the minimum length of the transport stream.

PSI/SI Type: This selection will dictate the tables that are automatically created at startup.

If **MPEG PSI** is selected, only the PAT and PMT will be generated. If **DVB SI** is selected, the mandatory DVB tables (NIT actual, TDT, SDT actual and EIT P/F actual) will also be generated.

Select the **Warn before**… checkbox to display a message when a change to the Stream Generation PSI/SI Type property is attempted (see page 7–40).

Output Settings.

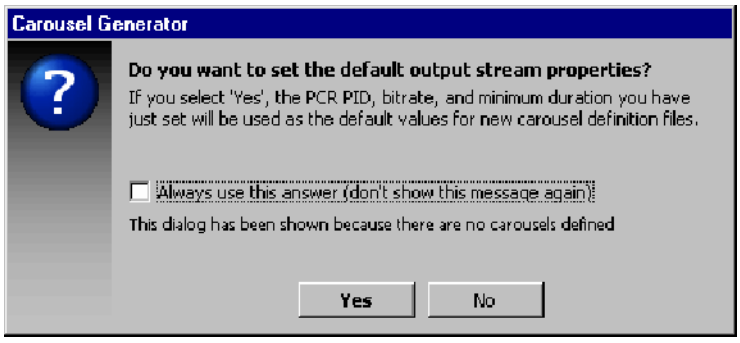
Output File: Enter the filename to be used in generating an output transport stream or browse to find an existing filename.

Automatically set the default values…

If at the start of a session (with no carousels defined), changes are made to the *Stream Generation Properties* (see page 7–40), whether or not the changes are saved as Carousel Generator defaults is dictated by this setting.

The options operate as follows:

Ask: The dialog box shown below will allow the user to choose between using the revised settings as future defaults or to only use them for this session.

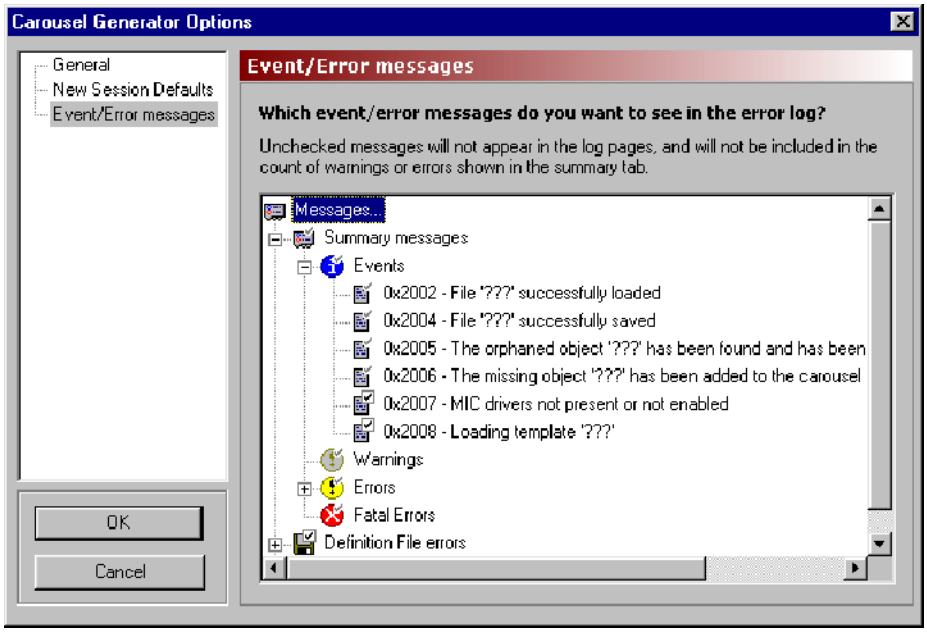

Carousel Generator
Do you want to set the default output stream properties?
If you select 'Yes', the PCR PID, bitrate, and minimum duration you have just set will be used as the default values for new carousel definition files.
Always use this answer (don't show this message again)
This dialog has been shown because there are no carousels defined
Yes
No

If the **Always use**… checkbox in the dialog box is enabled, the **Automatically set**… option in this screen will be reset to concur.

No: The revised settings will not be used as future defaults.

Yes: The revised settings will be used as future defaults.

Event/Error Messages screen


Carousel Generator Options
General
New Session Defaults
Event/Error messages
OK
Cancel
Event/Error messages
Which event/error messages do you want to see in the error log?
Unchecked messages will not appear in the log pages, and will not be included in the count of warnings or errors shown in the summary tab.
Messages...
Summary messages
Events
0x2002 - File '???' successfully loaded
0x2004 - File '???' successfully saved
0x2005 - The orphaned object '???' has been found and has been
0x2006 - The missing object '???' has been added to the carousel
0x2007 - MIC drivers not present or not enabled
0x2008 - Loading template '???'
Warnings
Errors
Fatal Errors
Definition File errors

The Log view, which can be displayed as part of the main application, displays a series of status and error messages, which advise the user of the progress of carousel and stream generation.

This screen allows the user to indicate which messages should be displayed. The Log view contains three tabbed screens: Summary, Definition File Syntax and TS Generation. These correspond to the message categories Summary messages, Definition File errors and TS Generation errors in this screen.

Each message category contains four levels of severity: Events, Warnings, Errors and Fatal Errors. Individual messages that can be displayed in the Log view are listed at each level.

Message Selection. The checkmarks associated with each message icon indicate the reporting status of the message.

Enabled (permanent): this message type will always be reported in the log view.

Enabled / disabled (toggle): this message type is enabled/disabled by the user. It will only be reported in the log view when enabled.

If one or more of the subsidiary message types in a category (Events, Warnings Errors) is disabled, this icon is displayed.

All messages in the Summary category and Fatal Error messages in all categories are all permanently enabled; they cannot be disabled. The remaining messages in the Carousel Definition File and Stream Generation categories can be enabled and disabled as required by clicking on the message icon.

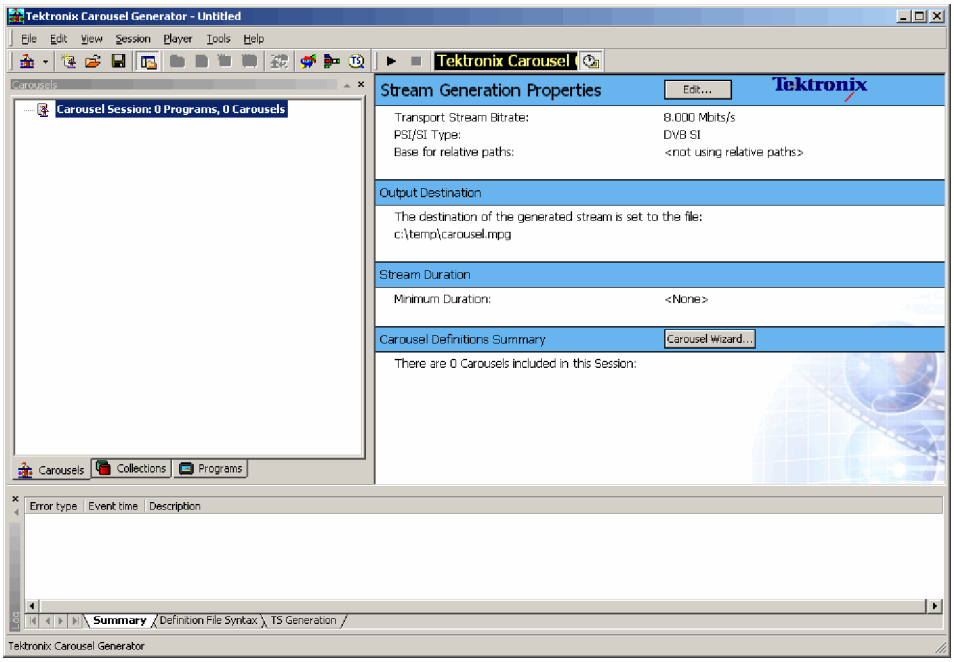
A brief description of a message can be displayed by clicking on the message name.

(See also *Log Window*, page 7-30.)

Creating a Session

A session in Carousel Generator is the activity during which objects are assembled in one or more carousels with a transport stream being the end result.

The initial activity when starting a session is to note the defaults that are already displayed in the Stream Generation Properties screen; these are derived from the Carousel Generator Options. If required, the values can be modified for the current session.



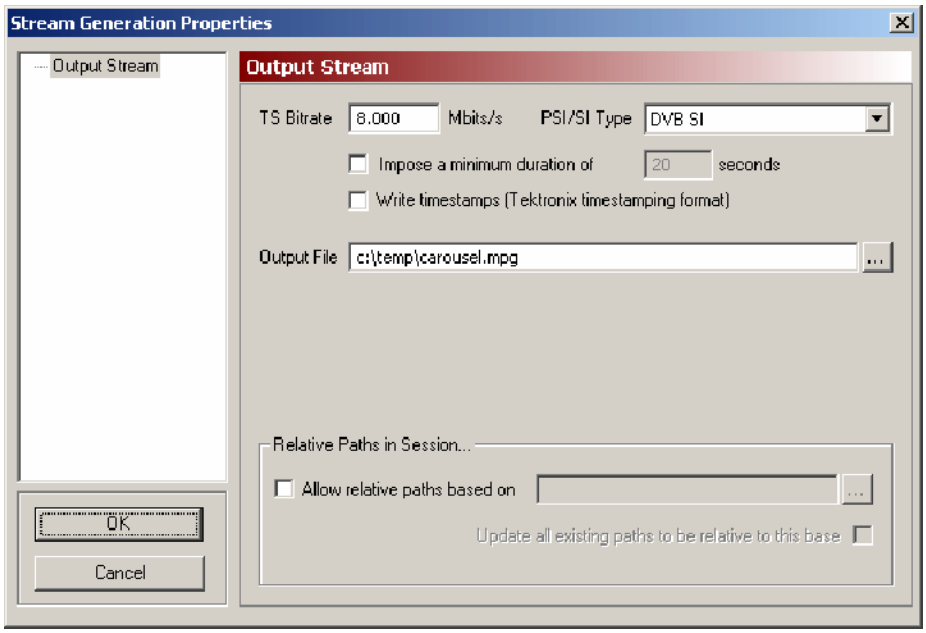
The values may be changed at any time in the session; it may be useful to review these settings at the end of a session, before the transport stream is created.

Select **Player > Stream Generation Properties...** to open the Stream Generation Properties dialog box or select **Edit...** in the properties window or double-click in the properties window.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

Stream Generation Properties

This screen provides stream generation values to be used in the current session.



TS Bitrate: The bit rate of the output transport stream. Range: 0.25 Mbit/s to 90 Mbit/s.

PSI/SI Type: This selection will dictate the tables that are created in the generated stream. If MPEG PSI is selected, only the PAT and PMT will be present. If DVB SI is selected, the mandatory DVB tables (NIT actual, TDT, SDT actual, and EIT p/f actual) will also be generated.

A warning may be issued noting that SI settings may be lost (see *New Session Defaults Screen*, page 7–35).

Output File: Enter the name and path of the output file. Select to specify a location on local or network drives.

Relative Paths in Session…

The paths of source components associated with a carousel file can be stored in relative or absolute format.

Allow relative paths based on

When enabled, Carousel Generator will interpret all incomplete paths as being relative to the base path specified in the adjacent text box.

The specified base path can be an absolute path (such as c:\data) or it can be relative to the current location of the carousel definition file. Note that if '.' is entered in the box, all relative paths are referenced to the current location of the carousel definition file.

Any automatically created paths will also be made relative to the base path, if possible.

If the checkbox is cleared (disabled), only absolute paths will be used.

Update all existing…

When enabled, Carousel Generator will attempt to convert all paths used in the session to be relative to the specified base path (where possible).

If the checkbox is cleared (disabled), existing absolute paths will be left unchanged.

Selecting the Carousel Type

There are a number of carousel types available from the various standards authorities. Carousel Generator makes available the types listed in the following table:

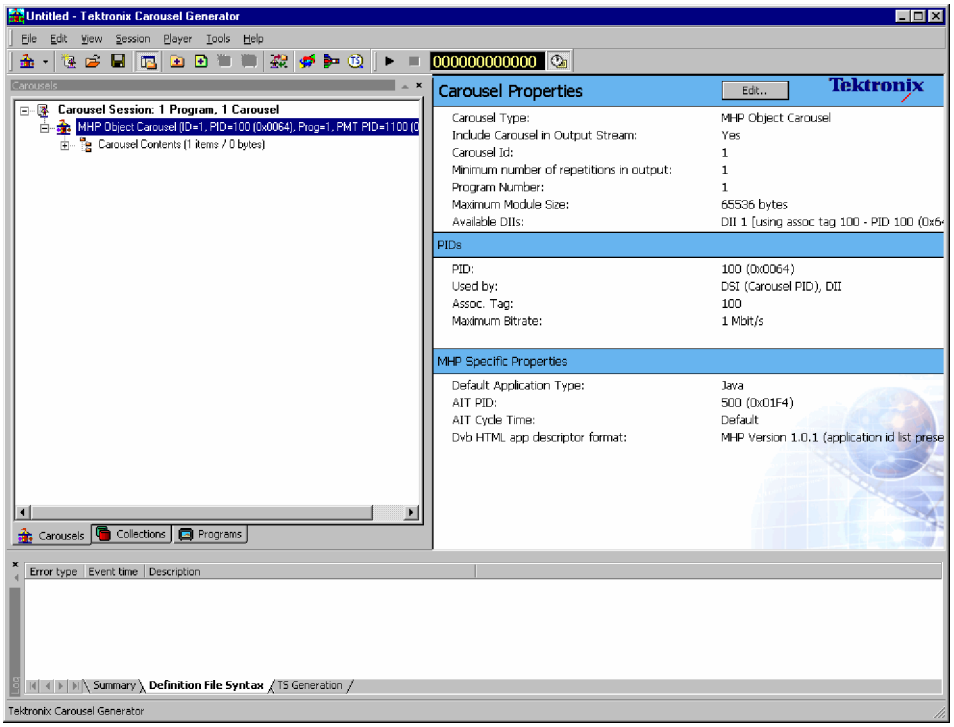
Carousel Type	Guiding Standard
DSMCC Object	ISO/IEC 13818-6: 1998 (MPEG)
DVB Object	DVB EN301 192 V1.2.1
DTT Object	DTG DTT Requirements for Interoperability V3.1
MHP Object	ETSI TS101 812 V1.1.2 & V1.1.1

Select **Session > New Carousel** and click on the required carousel type. A new (empty) carousel of the required type will be added to the session. The carousel will be assigned an identity number (ID) and allocated to a PID automatically.

Additional carousels can be added; successive IDs and PIDs will be allocated.

Modifying the Carousel Properties

The properties of individual carousel can be modified as required. A summary of the carousel properties is displayed in the Properties window.



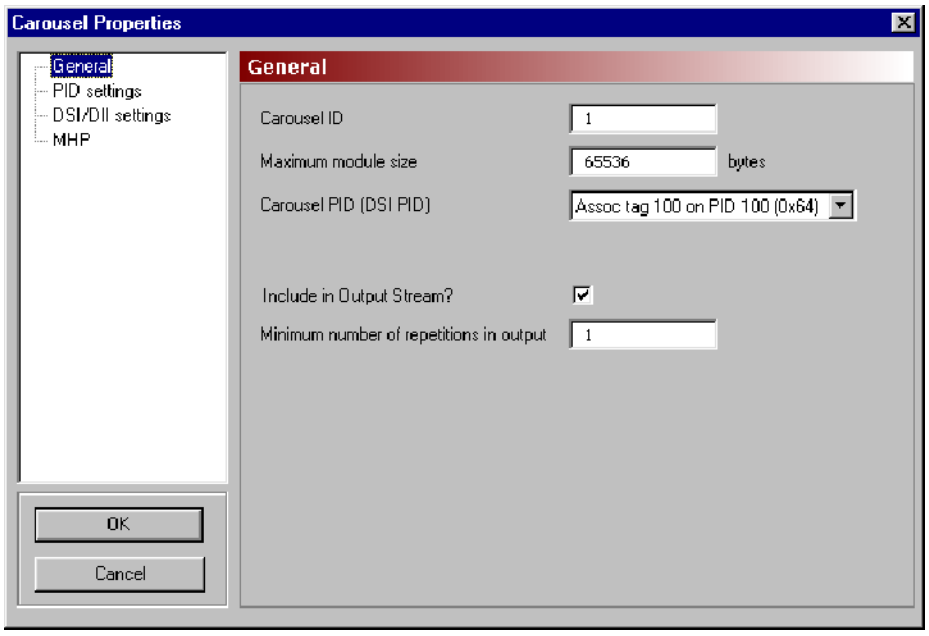
The contents of the carousel are displayed when the Carousel Contents node is highlighted.

To edit individual carousel properties, in the Carousels tab of the Sessions window and with the carousel node highlighted, select **Session > Carousel Properties...** or select **Edit...** in the Properties window. The Carousel Properties dialog box is displayed.

The number of screens available in the Carousel Properties dialog box is dependent on the carousel type selected. In the following notes, screens dedicated to only a single carousel type are identified; all other screens are common to all types.

The Carousel Properties dialog box can display up to four screens: General PID settings, DSI/DII settings, DTT Applications (DTT only), and MHP (MHP only).

General screen



Carousel ID: Unique carousel identity. The Carousel ID is normally generated automatically but can be changed by the user.
Range: 0 to 4294967295

Maximum module size: The maximum size of the modules used to carry the carousel objects. During output stream generation, if a module has one or more objects and does not have enough space for the next object, a new module will be created. If a module is empty and the object added will exceed the maximum size, the object is still added, but no more objects will be placed in that module.
Range: 0 to 4294967295 Default: 65536

Carousel PID (DSI PID): Select the required Association Tag from the drop-down list.
During carousel creation, a default Association is generated to carry the Carousel/DSI PID. This cannot be removed.

Include in Output… This flag allows the carousel to be included in or excluded from the output stream. If the checkbox is disabled, no reference to this carousel or its contents will appear in the generated output stream.

Minimum number…

Enter the minimum number of times that the carousel is to appear in the output stream; this can be repeated for each carousel in the session. The resulting output stream will be long enough to accommodate at least the minimum number of repetitions requested for each carousel.

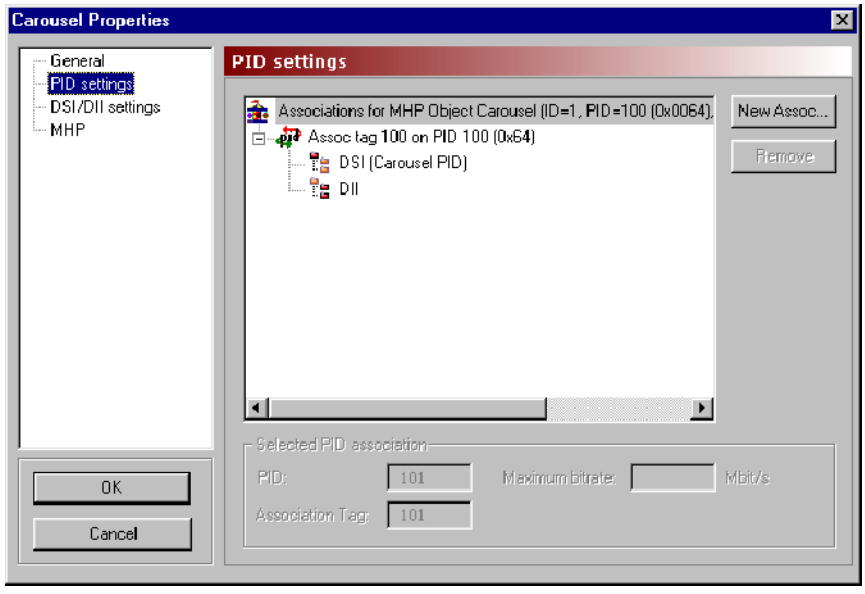
PID settings screen

The tree structure in the PID Settings screen shows the PID usage for the selected carousel's program. The DSI and DII messages carried in the carousel use an Association tag, which allows the BIOP messages in the carousel to be linked to a PID in the stream (see "BS ISO/IEC 13818-6:1998 Information Technology - Generic coding of moving pictures and associated audio information - Part 6: Extensions for DSM-CC).

To place the DII and DSI messages on different Association Tags, use the DSI/DII settings screen (see page 7–46).

During stream generation, each Association Tag specified will result in the following:

- An elementary stream (ES) with a stream type of 11 (DSMCC U-N messages) and the entered PID being added to the PMT ES loop.
- The Association Tag value will be inserted into an association_tag_descriptor inside this ES's descriptor loop.



Highlighting any of the association nodes will display the PID associations in the Selected PID association panel.

Select New Assoc... to create a new association node in the tree. The PID and Association Tag will be automatically allocated, but they can be changed in the Selected PID association panel.

Selected PID association

PID: This is the PID of the elementary stream (ES) carrying the DII and/or DSI messages.
Range: 0 to 8191 (see *PID Values*, page 7-45).

Association Tag: This is the 16 bit value carried in the association_tag_descriptor which is inserted in the ES descriptor loop of the PMT signaling this carousel.
Range: 0 to 65535

Maximum bitrate… This is the maximum bit rate allocated in the stream for this PID. If there is not enough bandwidth to support this rate, the actual bit rate will be less.
Range: 0.25 Mbit/s to 90 Mbit/s

PID Values. As stated, the valid range for PIDs is 0 to 8191. However, there are a number of restrictions on the actual values that can be used, since some are reserved or may be used in other carousels. The following table shows the elements that can and cannot share PID values. Unless otherwise noted, "No" indicates the entities in the row and column headers may not share a PID value in any carousel in a single session. 'Yes' indicates that the PID value may be shared with other entities in the same session; unless otherwise indicated in the Notes below.

	Reserved	PCR	PMT	AIT	DSI	DII
DII	No	No	No	No	Yes (Same as Carousel)	Yes (Same as Carousel)
DSI	No	No	No	No	No	-
AIT	No	No	No	No	-	-
PMT	No	No	Yes	-	-	-
PCR	No	No	-	-	-	-
Reserved	No	The Reserved PIDs are PIDs 0 to 31 (0x00 to 0x1F) and the Null PID 8191 (0x1FFF)				

***NOTE**. PIDs 0 to 15 (0x0000 to 0x000F) are reserved by MPEG; PIDs 16 to 31 (0x0010-0x001F) are additionally reserved by DVB.*

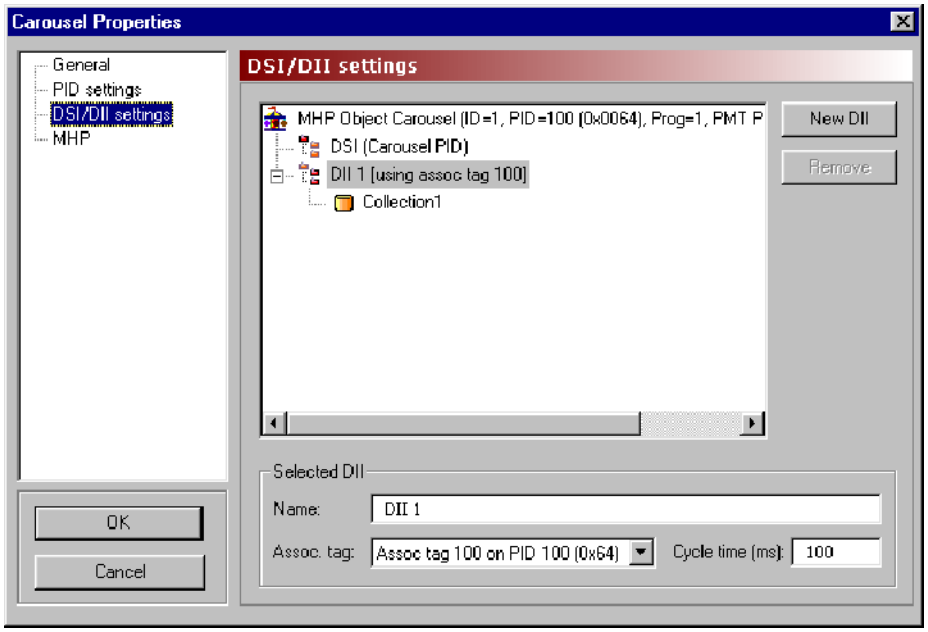
PMTs cannot share PIDs with anything but other PMTs. Multiple PMT sections can be on the same PID, so, if required, every carousel could have its PMT entry on the same PID (usually not done that way, but it can be).

The DIIs belonging to a single carousel can be on the same PID as its DSI or its other DIIs, but not on the same PID as DSIs or DIIs belonging to other carousels.

For example, the yes/no indicators in the PMT row/column indicate that the value of the PID carrying a PMT may not be shared with any other entities in the session. However, in the case of the PMT, see the above note.

DSI/DII settings screen

The tree structure in the DSI/DII Settings screen shows the DSI and DIIs that will be generated in the stream for the selected carousel. Each DSI/DII has an Association Tag and a cycle time, and DIIs have a user definable name.



Highlighting any of the DII nodes will display the PID associations in the **Selected DII** panel.

Select **New DII** to create a new DII using default values. The default Association Tag to use is decided by first checking if an existing DII uses the DSI tag. If so, this tag is used, otherwise the tag of the first DII in the list is used.

Selected DII

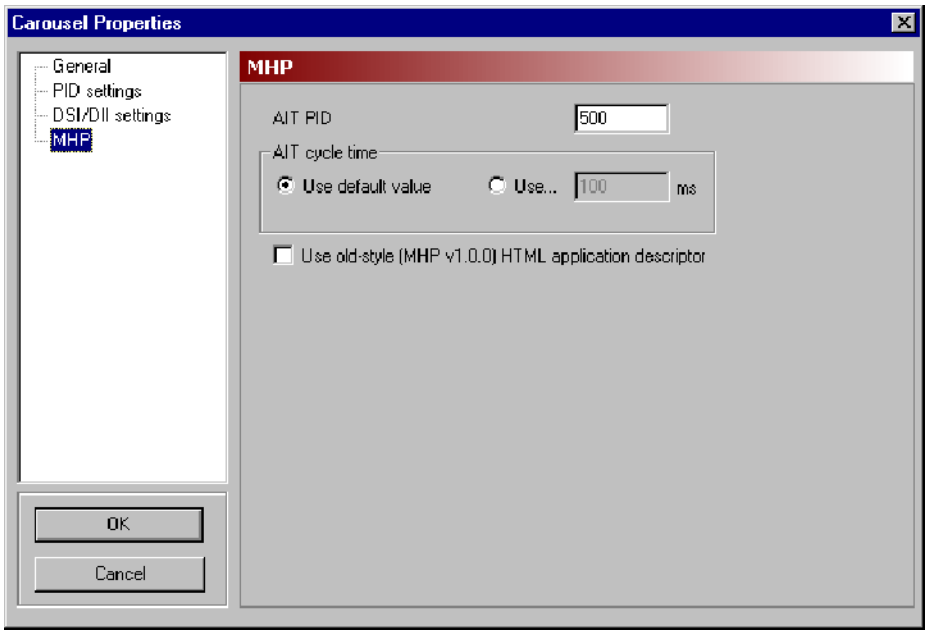
Name: This is a user allocated name for this DII. The name does not appear anywhere in the generated stream, only within the Carousel Generator.

Assoc. tag: This is the list of all the currently defined Association tags listed for this carousel. Assigning a different Association Tag to the DII effectively changes the PID that the DII messages will be carried on.
(Association tags can be added from the PID Settings screen.)

Cycle time (ms): This option sets the time taken for this DII to be repeated. For example, DIIs referencing boot classes may be given shorter cycle times to speed up the boot process.
Range: 1 ms to 3600 s.

To associate a collection with a DII, first create the DII, giving it a meaningful name, set the Association tag and Cycle time of the DII and close this dialog box. On the Collections tab of the Session window, edit the collection's properties to set the field **Using DII** to the new DII.

MHP



AIT PID — This is the PID that carries the Application Information Table (AIT).
Range: 0 to 8191 (see *PID Values*, page 7-45).

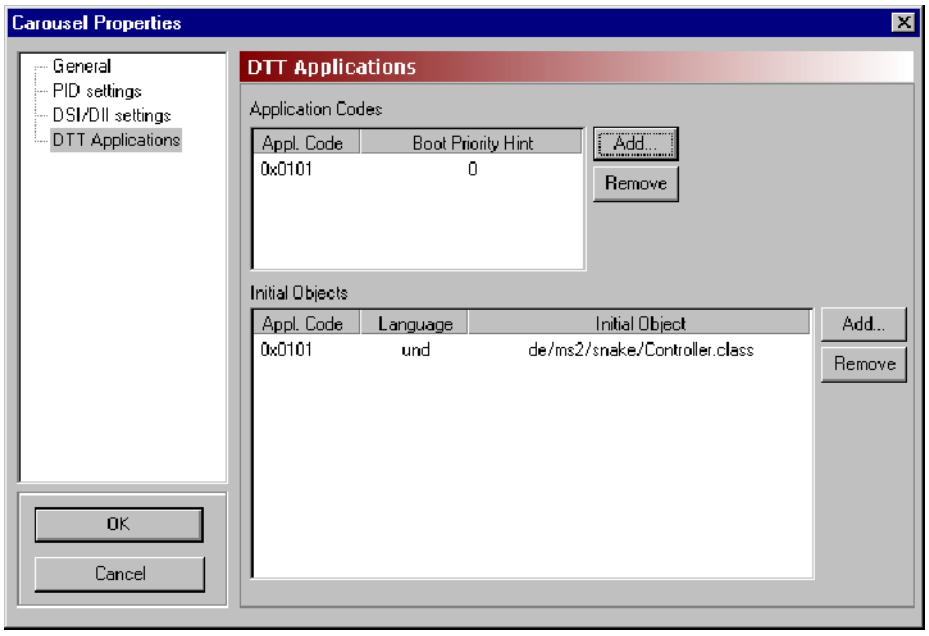
AIT cycle time: Set the time to be taken for the selected Carousel's AIT to be repeated. Default: 100 ms.

Use… Select this option to allow the AIT cycle time to be set manually. Range: 1 ms to 3600 s.

Use old-style… If this box is checked, the DVB-HTML application descriptor format as defined by MHP v1.0.0 (see MHP; ETSI 101812, Version 1.1.2 and 1.1.1) will be used.

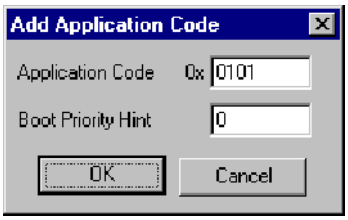
If this box is not checked, the new format as defined in MHP v1.1.2 (see MHP; ETSI 101812, Version 1.1.2 and 1.1.1) will be used. This will cause the DVB-HTML Application Descriptor to be properly formed and include an empty set of application IDs. To add application IDs to this descriptor, use the HTML Properties page on the MHP File Properties dialog box.

DTT Applications



Application Codes. The entries in this list will be added to the data_broadcast_id_descriptor in the elementary stream descriptor loop of the PMT. This descriptor lists the application types that can be booted from the elementary stream with which it is associated. The Boot Priority Hint is an indication of the application that should be booted in the case of more than one in the list being supported. The application with the highest Boot Priority Hint, in the range 0 to 255, will be booted first.

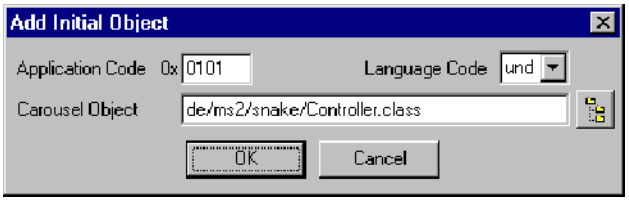
Add — Displays the **Add Application Code** dialog box.



Remove — Removes the highlighted Application Code.

Initial Objects. The Initial Object list allows different languages to have different boot objects. On stream generation, entries here will appear in the ServiceContextList part of the Service Gateway object.

Add — Displays the **Add Initial Object** dialog box.

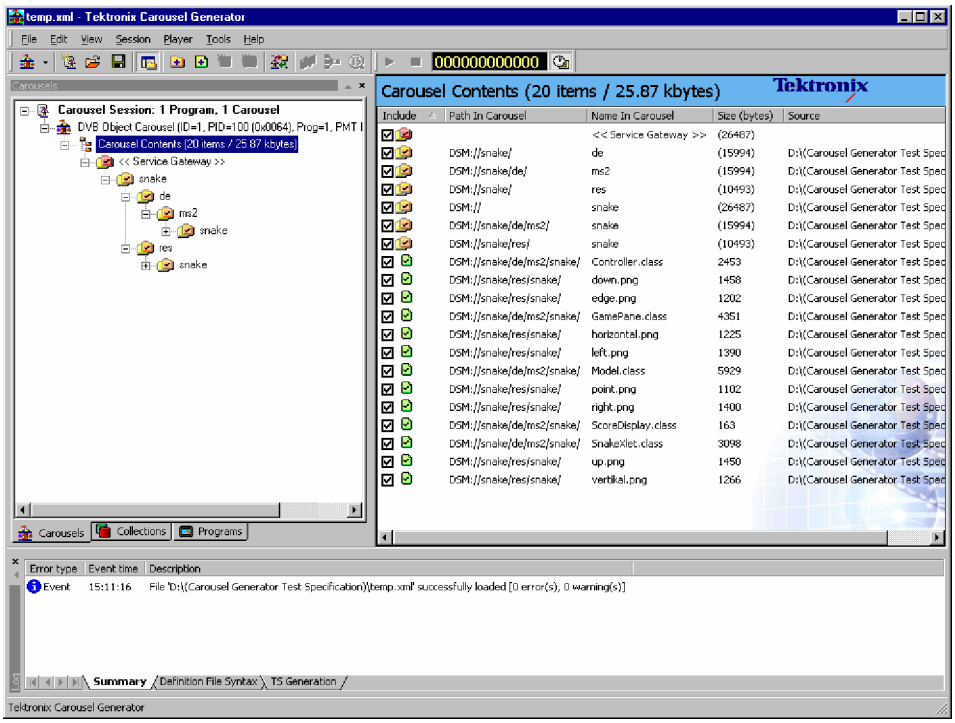


The **Application Code** should correspond to a code that is already listed in the **Application Codes** panel. A **Language Code** can be selected from the drop-down list. The object can be given a name in the **Carousel Object** field. If objects have already been associated with the carousel, the adjacent button will display the contents of the carousel, from which an object can be selected.

Remove — Removes the highlighted Initial Object.

Carousel Contents

Each carousel initially contains two subnodes: Carousel Contents and Service Gateway. The carousel will eventually contain all of the objects associated with a particular function or feature. These objects can be arranged in a hierarchy of directories and files all displayed beneath the Service Gateway node.



Files and directories can be manipulated in a variety of ways:

- All commands are accessible via the Menu Bar or context sensitive right-click menus.
- Files and directories can be dragged and dropped within Carousel Generator.
- Files and directories can be dragged from Windows Explorer.

The properties of files and directories can be edited after they have been incorporated into a carousel.

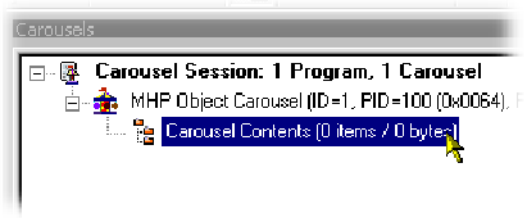
Adding an Object (File/Directory)

Individual files or complete directory structures can be added to a carousel. New directories can be created.

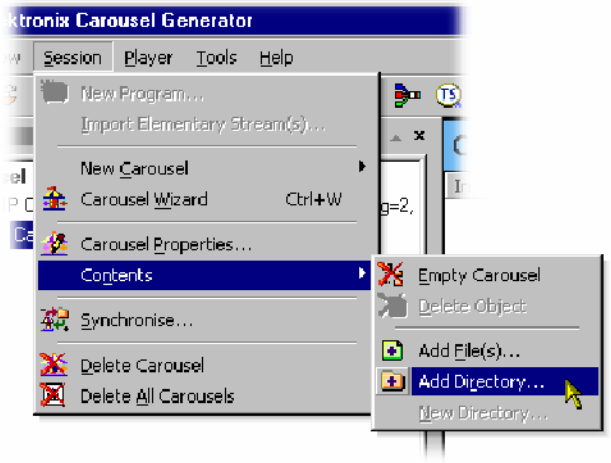
The location that an object is to be added to should be highlighted.

Adding Directories.

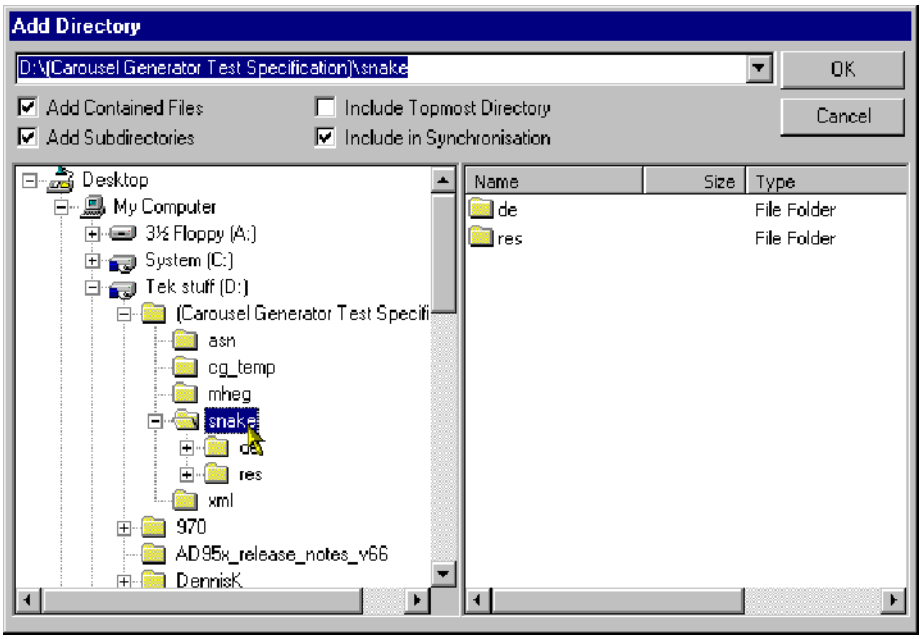
1. Highlight the node in the carousel where the directory is to be added.


Carousels
Carousel Session: 1 Program, 1 Carousel
MHP Object Carousel (ID=1, PID=100 (0x0064),
Carousel Contents (0 items / 0 bytes)

2. Select **Carousel > Contents > Add Directory**…



The **Add Directory** dialog box is displayed.



The **Add Directory** allows the user to select any available directory. The directory path is shown in the top field; the most recently accessed directories are available in the drop-down list. The adjacent checkboxes have the following functions:

Add Contained Files: All files contained in the selected directory (and any subdirectories if **Add Subdirectories** is enabled) will be added to the carousel.

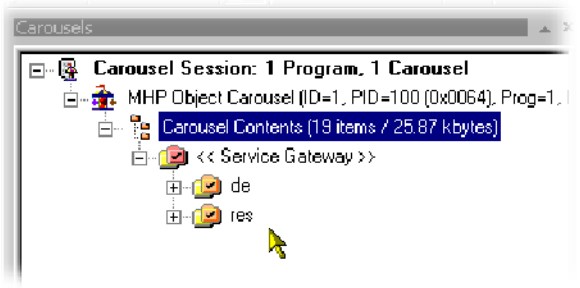
Add Subdirectories: All subdirectories of the selected directory will be added to the carousel.

Include Topmost Directory: The selected directory will be added to the carousel (not just the files and/or subdirectories).

Include in Synchronization: The selected directory will by synchronized with its source directory (see page 7-65).

3. Select the required directory and enable the required checkbox options. Select **OK** to add the directory to the carousel.

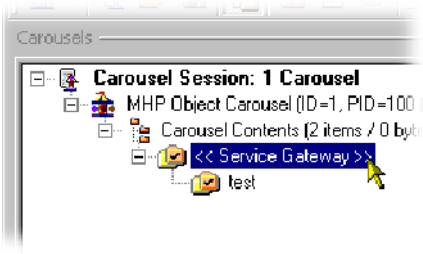
4. The new directory is added below the highlighted node.



***NOTE**. When directories are dragged and dropped from Windows Explorer, all subdirectories and files will be included. If the Shift key is held down during this action, the topmost directory name is not included.*

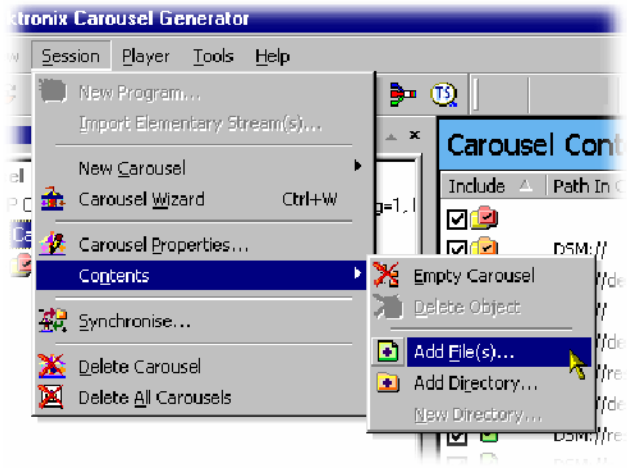
Adding Files.

1. Highlight the directory node in the carousel where the file is to be added.



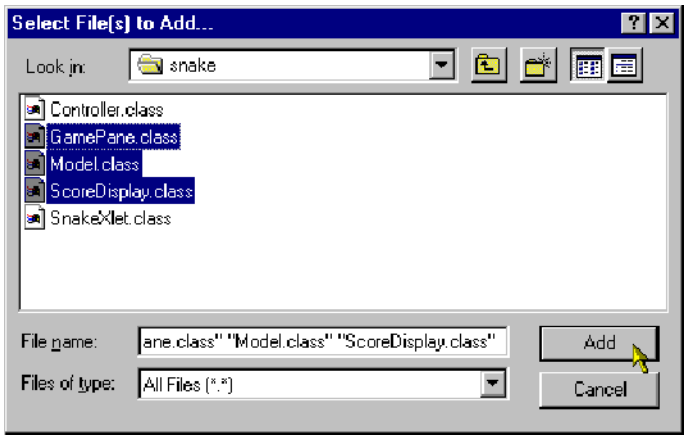
2. Select **Carousel > Contents > Add file(s)**…

   The **Select File(s) to Add** dialog box is displayed.

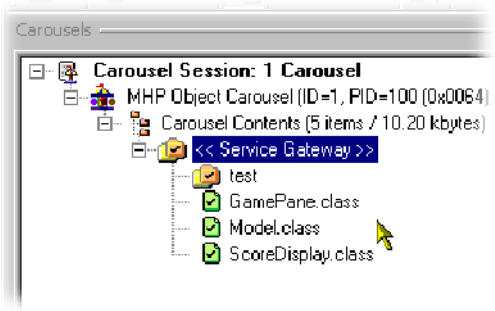


3. Select the file(s) to be added.

4. Select **OK** to add the files to the carousel.

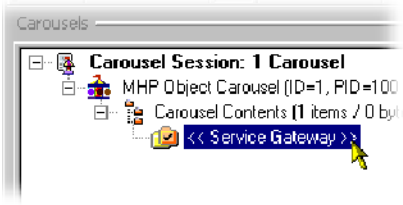


5. The new file(s) are added to the selected directory node.

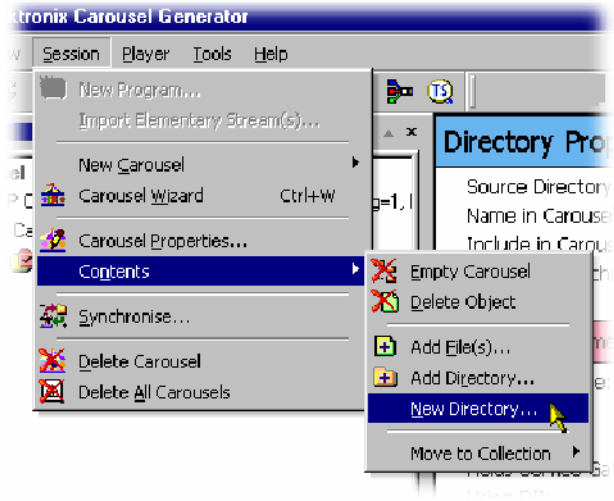


Creating a New Directory.

1. Highlight the node in the carousel where the directory is to be created. (In this screenshot, the new directory is the first object to be created.)

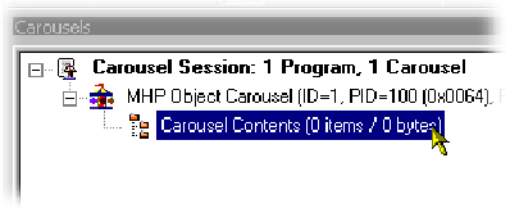


2. Select **Carousel > Contents > New Directory**…



3. Enter the name of the new directory and select **OK** to create the directory.

4. The new directory is created below the highlighted node.


Carousels
Carousel Session: 1 Program, 1 Carousel
MHP Object Carousel (ID=1, PID=100 (0x0064),
Carousel Contents (0 items / 0 bytes)

Moving an Object

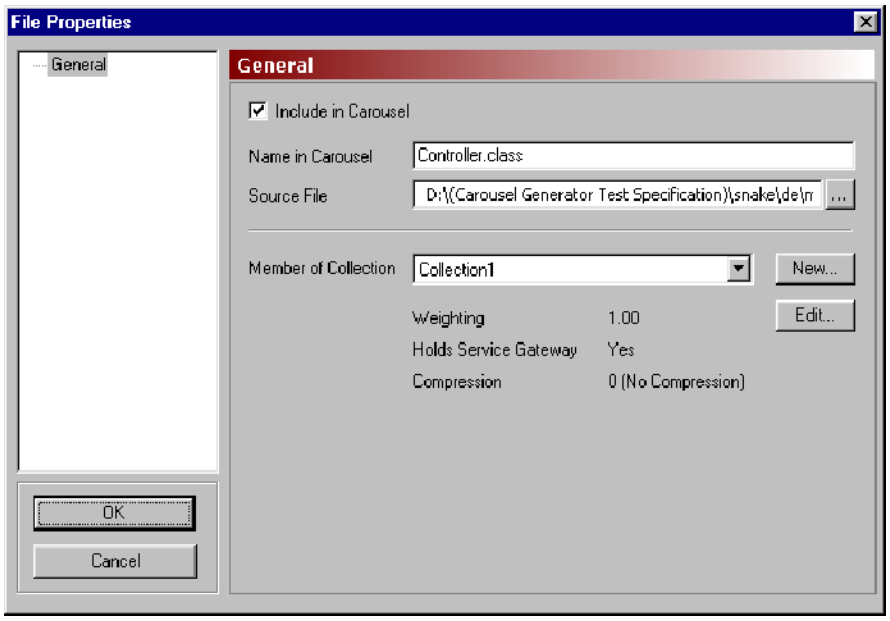
Files and directories are moved within a carousel using standard Windows commands and techniques, such as Copy, Cut and Paste and Drag, and Drop.

Removing an Object

Files and directories are removed from a carousel using standard Windows commands and techniques.

File Properties

When a file is highlighted, the properties of that file are summarized in the Properties window. The properties can be viewed in detail and edited by selecting **Edit**… and displaying the **File Properties** dialog box.



The File Properties dialog boxes for files contained in all types of carousel are similar. However, for the MHP carousel type, if a file is designated as an application (Java or HTML), there are additional properties; these are described in the following sections.

Include in Carousel: If this box is checked, the file object will be included in the generated carousel. If not checked, the file object will not be included in the generated carousel.

Name in Carousel: This is the name of the object as it will appear in the BIOP message in the output stream.
Range: 254 characters maximum (specified by the DSMCC specification. Additional characters will be truncated.)
ASCII character set excluding: \ **:** / *** ? ” < > |**.

Source File: This field is set when the object is added to the carousel and can be edited to point to another object if required. This field does not appear in the output stream and is limited to 260 characters.

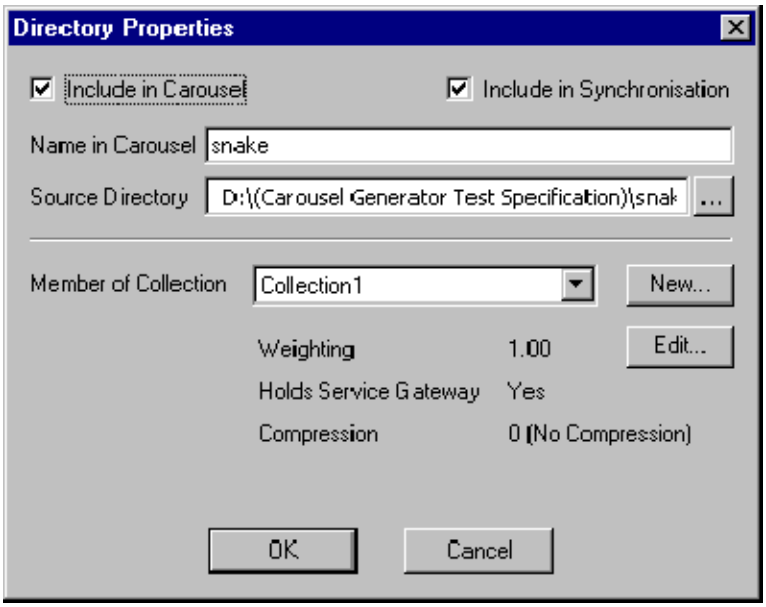
Member of Collection: This is a list of all the collections currently included in this carousel. Selecting a different collection effectively put this object into a different module possibly with different cycle times and compression characteristics. In the case of a directory object, all child objects below it are also moved to the selected collection.

New Create a new collection (see page 7-66).

Collection Properties: Displays a summary of the properties of the collection that the object is a member of. The properties can be edited by using the **Edit**… button to open the collection Properties dialog box (see page 7-68).

Directory Properties

When a directory is highlighted, the properties of that directory are summarized in the Properties window. The properties can be viewed in detail and edited by selecting **Edit**… and displaying the **Directory Properties** dialog box.



Include in Carousel: If this box is checked, the directory object will be included in the generated carousel. If not checked, the directory object will not be included in the generated carousel.

Include in Synchronization
If this box is checked, the source directory will be included in the Synchronization process which aims to match the source directory structure with the carousel structure, removing and adding file and directory objects as necessary.
If this box is cleared, this directory will not be compared to the source directory and neither will any subdirectories, regardless of their individual settings.

Name in Carousel: This is the name of the object as it will appear in the BIOP message in the output stream.
Range: 254 characters maximum (specified by the DSMCC specification. Additional characters will be truncated);
ASCII character set excluding: \ **:** / *** ? " < > |**.

Source Directory: This field is set when the directory is added to the carousel and can be edited to point to another directory if required. Newly created directories may not initially have a correct source directory, but this can be edited if desired. This field does not appear in the output stream and is limited to 260 characters.

The Source Directory will be used when the carousel is synchronized only if the **Include in Synchronization** box is checked (see also page 7–65).

Member of Collection: This is a list of all the collections currently included in this carousel. Selecting a different collection effectively put this object into a different module with possibly different cycle times and compression characteristics. In the case of a directory object, all child objects below it are also moved to the selected collection.

New Create a new collection (see page 7–66).

Collection Properties: This panel displays a summary of the properties of the collection of which the object is a member. The properties can be edited by using the **Edit**… button to open the Collection Properties dialog box (see page 7–68).

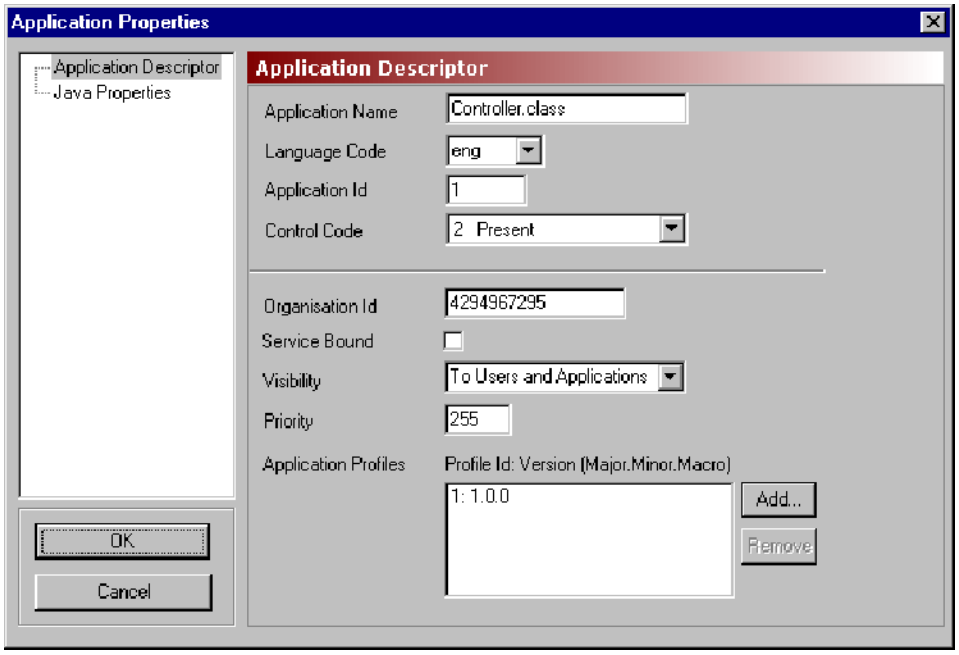
Applications

In MHP, applications are transmitted in object carousels. Applications can be written in Java or HTML. All files that make up the application should be added to the carousel. However, the receiver must be made aware of the entry point into the application and certain other information about the characteristics of the application. This information is sent in the Application Information Table (AIT), which the receiver must process before it can start any application.

To define an application entry point and other application information, highlight a file and select **Carousel > Contents > Make Java Application** or **Make HTML Application**. The **Application Properties** dialog box will be displayed. The components of the Application Properties screens are described in the following paragraphs. Note that when the file properties of an application are viewed, the File Properties **General** screen is also displayed.

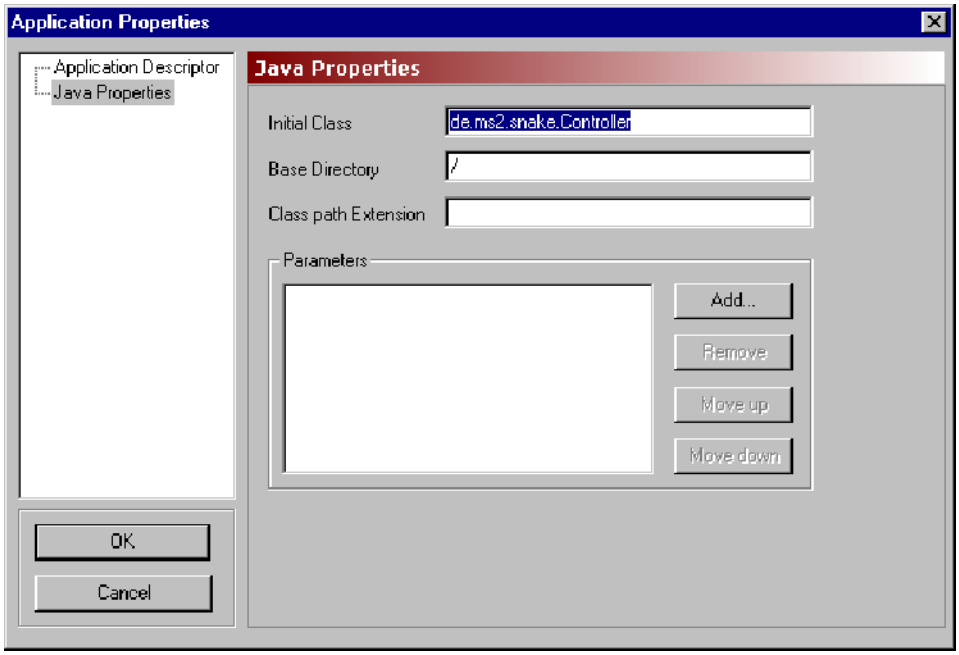
Application Descriptor screen. The Application Descriptor screen is common to both Java and HTML applications.

All the properties on this screen are described in the Application Signaling section of the MHP specification; TS 101 812 v1.1.1, Section 10, Application Signaling.



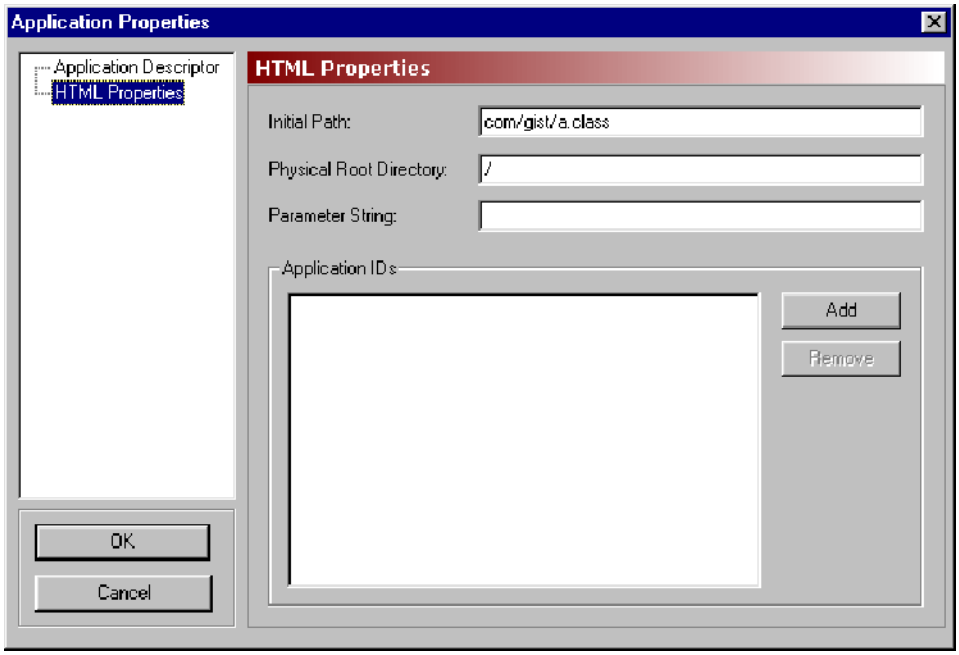
Application Descriptor Name	TS 101 812 identity
Application Name:	Application Name Descriptor
Language Code:	Application Name Descriptor
Application ID:	Application Identifier
Control Code:	application_control_code
Origination ID:	Application Identifier
Service Bound:	Application Descriptor
Visibility:	Application Descriptor
Priority:	Application Descriptor
Application Profiles:	Application Descriptor

Java Properties screen. All the properties on this screen are described in the DVB-HTML Specific descriptors of the MHP specification; TS 101 812 v1.1.1, Section 10, Application Signaling.



Application Descriptor Name	TS 101 812 identity
Initial Class:	DVB-J Application Location Descriptor
Base Directory:	DVB-J Application Location Descriptor
Class Path Extension:	DVB-J Application Location Descriptor
Parameters	DVB-J Application Descriptor

HTML Properties screen. All the properties on this page are described in the DVB-Java Specific descriptors of the MHP specification: TS 101 812 v1.1.1, Section 10, Application Signaling.

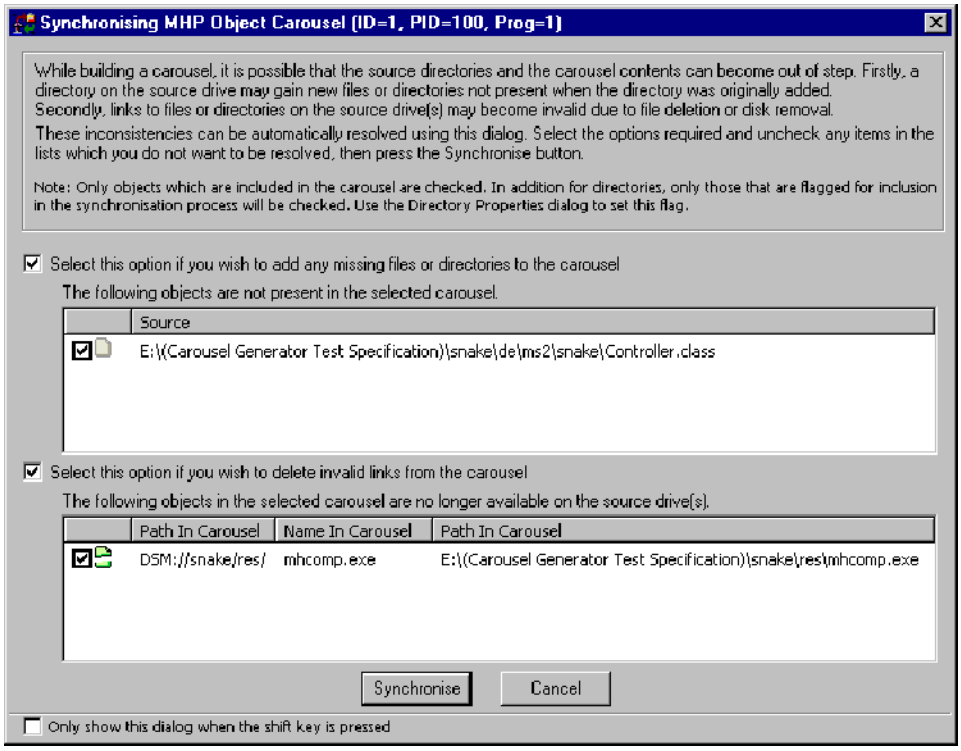


Application Descriptor Name	TS 101 812 identity
Initial Path:	DVB-HTML Application Location Descriptor
Physical Root Drive:	DVB-HTML Application Location Descriptor
Parameter String:	DVB-HTML Application Descriptor

Synchronicity

Directory objects included in carousels are simply references to directories that exist elsewhere; for example, a PC hard drive.

If the **Include in Synchronization** checkbox is enabled for a directory, the directory will be included in the Synchronization process. When **Session > Synchronise**… is selected, the source directory structure is matched with the carousel directory structure. Any objects missing from either the source directory structure or the carousel directory structure are listed in the Synchronizing MHP Object Carousel dialog box (as shown in the following screenshot).


Synchronising MHP Object Carousel (ID=1, PID=100, Prog=1)
While building a carousel, it is possible that the source directories and the carousel contents can become out of step. Firstly, a directory on the source drive may gain new files or directories not present when the directory was originally added. Secondly, links to files or directories on the source drive(s) may become invalid due to file deletion or disk removal.
These inconsistencies can be automatically resolved using this dialog. Select the options required and uncheck any items in the lists which you do not want to be resolved, then press the Synchronise button.
Note: Only objects which are included in the carousel are checked. In addition for directories, only those that are flagged for inclusion in the synchronisation process will be checked. Use the Directory Properties dialog to set this flag.
Select this option if you wish to add any missing files or directories to the carousel
The following objects are not present in the selected carousel.
Source
E:\(Carousel Generator Test Specification)\snake\de\ms2\snake\Controller.class
Select this option if you wish to delete invalid links from the carousel
The following objects in the selected carousel are no longer available on the source drive(s).
Path In Carousel
Name In Carousel
Path In Carousel
DSM://snake/res/
mhcomp.exe
E:\(Carousel Generator Test Specification)\snake\res\mhcomp.exe
Synchronise
Cancel
Only show this dialog when the shift key is pressed

Files or directories available at source but not currently included in the carousel can be automatically added to the carousel by enabling the checkbox (**Select this option if you wish to add any missing files or directories to the carousel**). Individual files and directories listed in the panel can be included or excluded from the activity by enabling or disabling the adjacent checkbox.

Files or directories listed in the carousel but not available at the source can be automatically removed from the carousel by enabling the checkbox (**Select this option if you wish to delete invalid links from the carousel**). Individual files and directories listed in the panel can be included or excluded from the activity by enabling or disabling the adjacent checkbox.

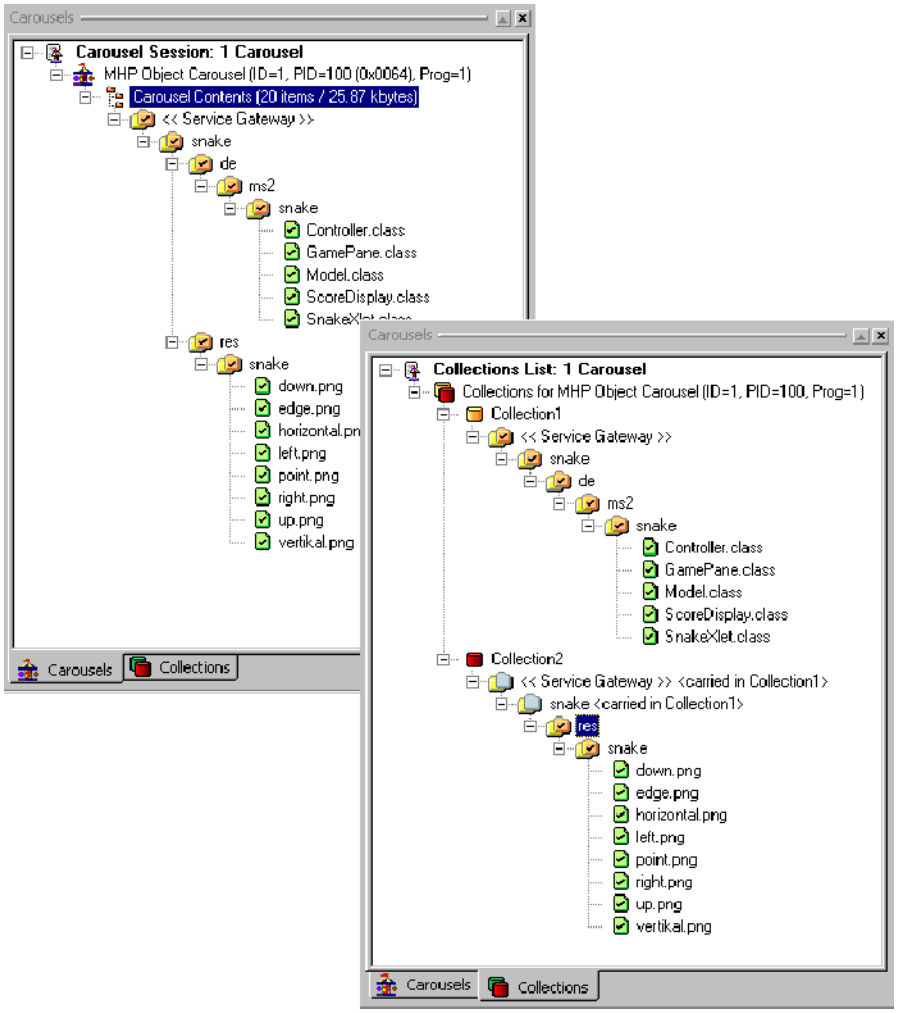
Select **Synchronise** to synchronizes the carousel with the source files in accordance with the checkbox selections.

***NOTE**. If the **Include in Synchronization** checkbox is disabled for a directory, this directory will not be compared to the source directory and neither will any subdirectories, regardless of their individual settings.*

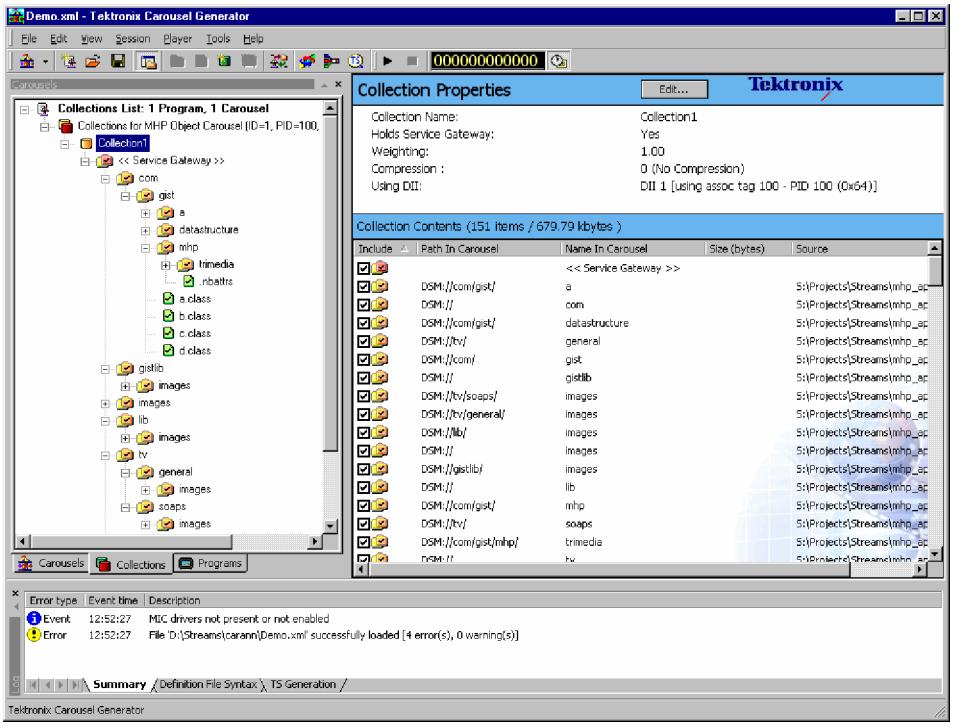
Collections

(See *Carousel Generator Overview*, page 7–2)

Collections provide a means by which objects can be grouped and transmitted in a single carousel with differing properties, such as repetition rate and compression. Each collection can have different properties; all objects in a collection are transmitted with the same properties.



Collections can be viewed by selecting the **Collections** tab in the Session window.



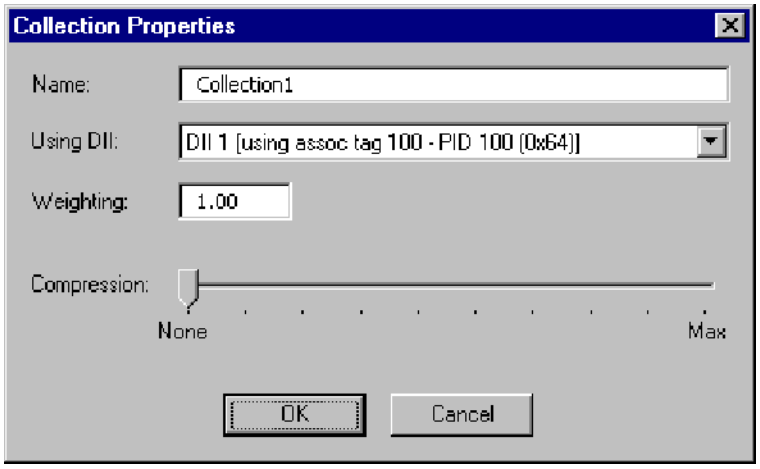
A summary of a collection's properties is displayed in the Properties window. With a collection node highlighted, the contents of the collection can be viewed.

Three icons are used at the Collection node:

(orange)	Collection containing the Service Gateway. At least one collection must exist during any session. The collection containing the Service Gateway cannot be deleted
(red)	Ordinary collection.
	Compressed collection.

To open the Collection properties dialog box, select **Edit**… in the Collection Properties bar.

Collection Properties



Name: Enter the required name.

Using DII: This is the list of all the DIIs in the carousel. The Collections in the carousel (and therefore the generated DSMCC modules) can be distributed among several DIIs or all be referenced by a single DII.
This enables, for example, a minimal collection containing just the objects needed for booting to be referenced in a DII with a short cycle time.

Weighting: This is the relative priority of the collections in a single carousel. For example, the objects in a collection with a weighting of 1.5 will be repeated half as often as those in a collection with a weighting of three.

This enables, for example, boot classes in a collection to be given a higher weighting than the other files in a carousel. The weighting is a floating point value so virtually any ratio can be achieved.
Range: 0 to 10000
A value of 0 signifies the objects will not appear in the stream.

Compression: The modules can be optionally compressed to decrease module size. There are 10 levels of compression ranging from 0 (no compression) to 9 (maximum compression). Compression is applied to the complete collection, although compression can be applied via any of the property dialog boxes. The collection node icon in the Collections view will indicate that compression is to be applied.

Adding a New Collection

To add a new collection, right-click on the collections node in the Collections Session window and select **New Collection**. The properties of the new collection can be modified as required.

Removing a Collection

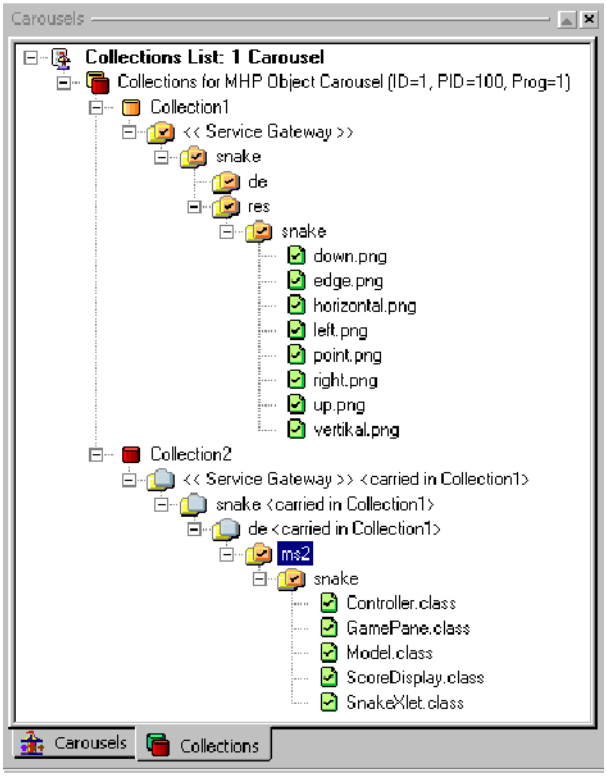
To delete a collection, highlight the collection node and select **Edit > Delete Collection**. However, note that a collection cannot be deleted while it contains objects or while it contains the Service Gateway. These objects must be deleted or moved to another collection.

Moving Objects between Collections

Objects can be dragged and dropped or cut and pasted between collections in the same carousel.

When dragging and dropping directories, pressing the Shift key down while the object is moved will move only the directory, not the contained items. If the Shift key is not used, the directory and its contents are moved.

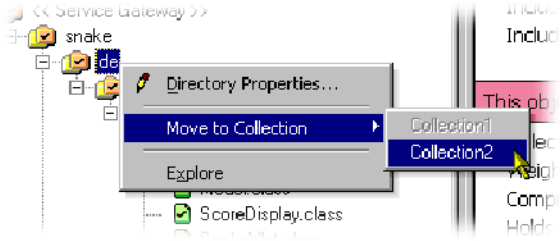
When items (file or directory) that are part of a tree structure are moved between collections, the complete path, from the Service Gateway is shown. The icons above the moved object are grayed out to indicate that they are carried in another collection (in the screenshot, they are the directory icons without a check mark or a cross within them).



The node description indicates the owning collection.

NOTE. *When an object is not included in the synchronization process, the icon changes from* *to* *(see also* Synchronicity, *page 7-65).*

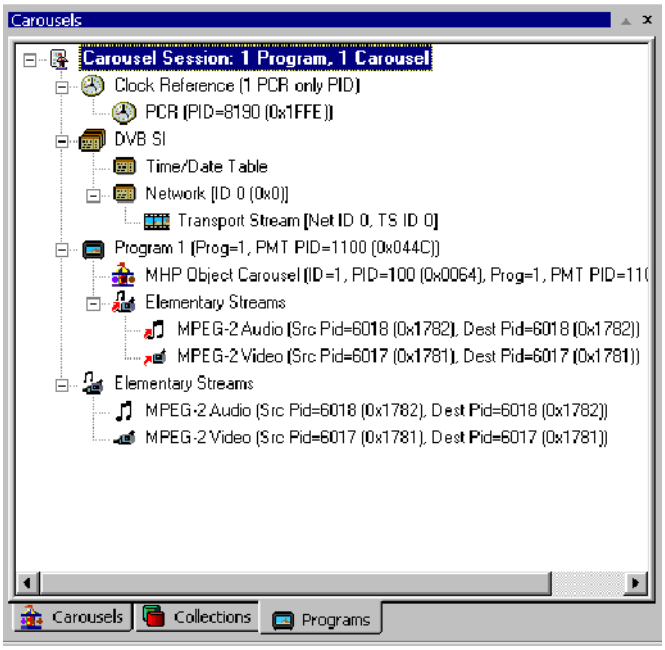
Objects can also be moved between collections in the same carousel by right-clicking on the object to be moved and selecting the collection from the **Move to Collection** list. All current collections will be included in the list.



Programs

(See *Carousel Generator Overview*, page 7-2)

Programs allow audio and video content to be added to the carousel-carrying stream. An example of the Program view is shown below:


Carousels
Carousel Session: 1 Program, 1 Carousel
Clock Reference (1 PCR only PID)
PCR (PID=8190 (0x1FFE))
DVB SI
Time/Date Table
Network (ID 0 (0x0))
Transport Stream (Net ID 0, TS ID 0)
Program 1 (Prog=1, PMT PID=1100 (0x044C))
MHP Object Carousel (ID=1, PID=100 (0x0064), Prog=1, PMT PID=11(
Elementary Streams
MPEG-2 Audio (Src Pid=6018 (0x1782), Dest Pid=6018 (0x1782))
MPEG-2 Video (Src Pid=6017 (0x1781), Dest Pid=6017 (0x1781))
Elementary Streams
MPEG-2 Audio (Src Pid=6018 (0x1782), Dest Pid=6018 (0x1782))
MPEG-2 Video (Src Pid=6017 (0x1781), Dest Pid=6017 (0x1781))
Carousels
Collections
Programs

Note that the Carousel Session is still the ‘root’ of the view, but in this view, the program content is also shown; this includes tables and streams.

PCR PID references are displayed under the Clock Reference node.

Mandatory PSI/SI information is created by default and included in the generated stream. Changes made to the stream content are reflected in the PSI/SI information. Individual settings are accessible in the various Programs properties dialog boxes.

The **PSI/SI** node displays either MPEG or DVB service information that cannot be easily included elsewhere.

- For MPEG PSI, only the Transport Stream ID, which is carried in the PAT, is displayed.
- For DVB SI, the Transport Stream ID is augmented by mandatory DVB SI (NIT, SDT (actual), EIT (actual present/following) and TDT.) The TDT (**Time/Date Table**) and the NIT (**Network**) are the only entries under the PSI/SI node. Parameters for the other tables are available in other dialog boxes.

Under each **Program** node is a list of all the program components - Carousels and video and audio elementary streams.

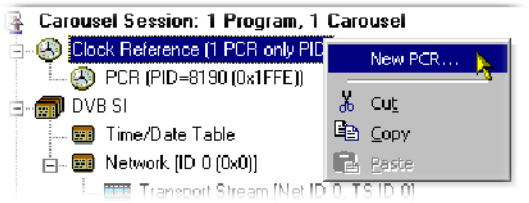
The **Elementary Streams** node lists the elementary streams that are included in the stream. These can be associated with one or more programs. Note that the elementary streams will be included in the generated stream even if they are not associated with a program.

Clock Reference

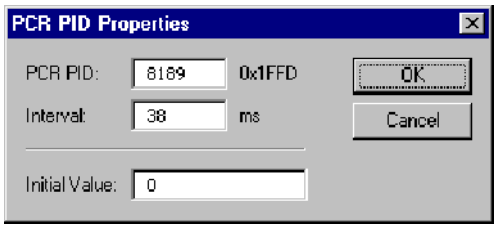
This node indicates which PIDs are carrying PCRs.

Adding a PCR.

1. Highlight the Clock Reference node in the Programs view.
2. From the right-click menu select **New PCR**….



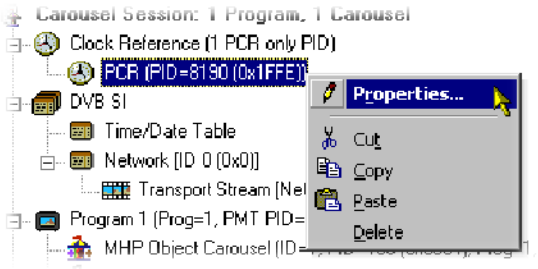
3. In the **PCR PID Properties** dialog box, make the changes required and select **OK**.

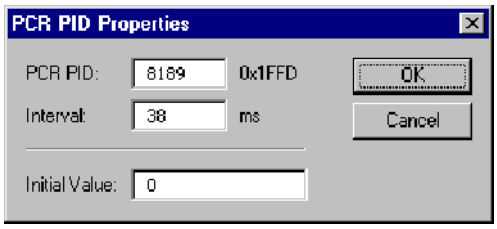


Note that the new PCR is added to the Clock Reference node.

Also available on the Clock Reference right-click menu are Cut, Copy, and Paste. These operations follow normal Windows conventions. Messages will be displayed where conflicts arise between existing PCRs and proposed new or pasted PCRs.

PCR Edit. The **PCR PID Properties** dialog box of an existing PCR PID can be opened by highlighting the PCR PID and selecting **Properties**… from the right-click menu.





PSI/SI The content of the SI node will depend on the SI Type selected: MPEG or DVB.

SI Type. SI Type is normally set in the Stream Generation properties (see page 7-40). However, a change can be made at any time before generation of the stream.

Switching SI types may involve some loss of data or some creation of default values. When switching from MPEG PSI to DVB SI, default values are applied to the TDT and Network information; the Transport Stream ID will be copied. Switching from DVB SI to MPEG PSI requires only the Transport Stream ID to be copied. In this phase, any user changes to the default values in the DVB SI properties will be lost and will need to be reentered if the SI type is changed back to DVB, or a new session is created.

The EIT and SDT information is maintained between switching SI type as it is stored in the Program Properties. The tables will simply not be generated if the type is MPEG.

To switch between SI types during a session, highlight the **SI** node in the Programs view and select the required **SI Type** from the right-click menu.

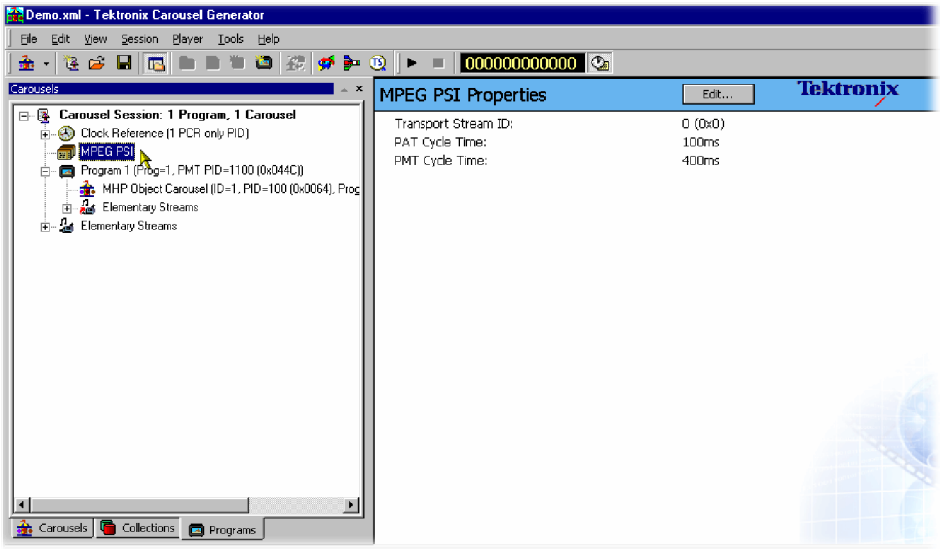


Figure 7-1: MPEG PSI

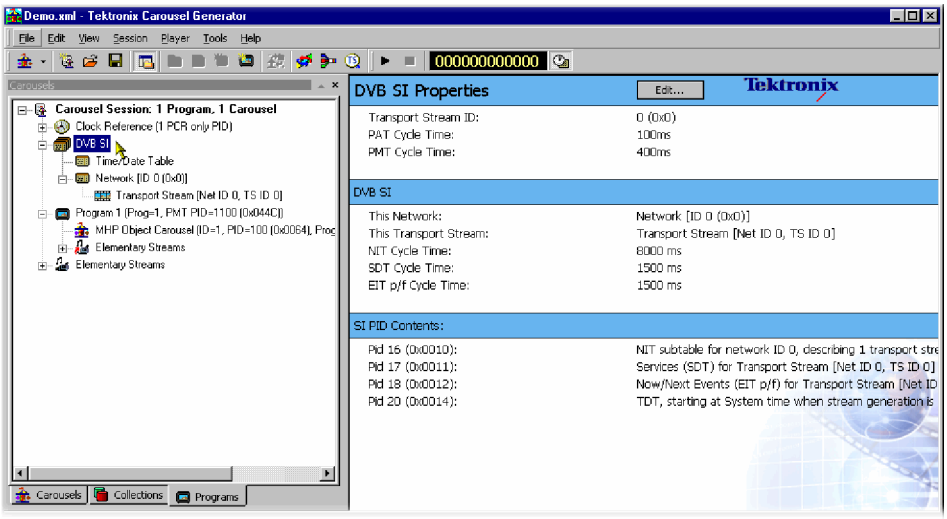
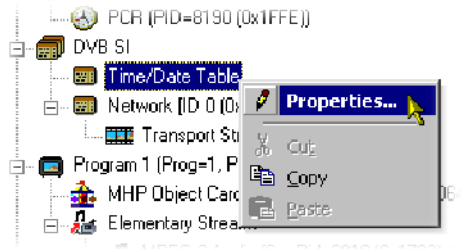
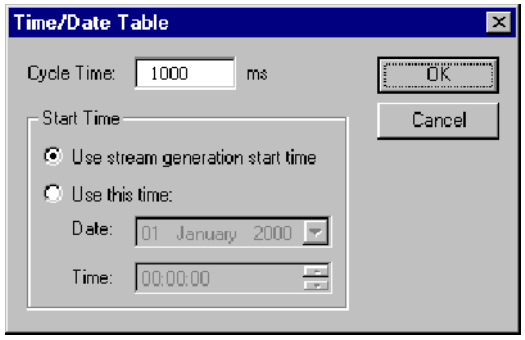

Demo.xml - Tektronix Carousel Generator
File Edit View Session Player Tools Help
000000000000
Carousels
Carousel Session: 1 Program, 1 Carousel
Clock Reference (1 PCR only PID)
DVB SI
Time/Date Table
Network (ID 0 (0x0))
Transport Stream (Net ID 0, TS ID 0)
Program 1 (Prog=1, PMT PID=1100 (0x044C))
MHP Object Carousel (ID=1, PID=100 (0x0064), Prog
Elementary Streams
Elementary Streams
Carousels
Collections
Programs
DVB SI Properties
Edit...
Tektronix
Transport Stream ID: 0 (0x0)
PAT Cycle Time: 100ms
PMT Cycle Time: 400ms
DVB SI
This Network: Network (ID 0 (0x0))
This Transport Stream: Transport Stream (Net ID 0, TS ID 0)
NIT Cycle Time: 8000 ms
SDT Cycle Time: 1500 ms
EIT p/f Cycle Time: 1500 ms
SI PID Contents:
Pid 16 (0x0010): NIT subtable for network ID 0, describing 1 transport stre
Pid 17 (0x0011): Services (SDT) for Transport Stream (Net ID 0, TS ID 0)
Pid 18 (0x0012): Now/Next Events (EIT p/f) for Transport Stream (Net ID
Pid 20 (0x0014): TDT, starting at System time when stream generation is

Figure 7-2: DVB SI

Time/Date Table (DVB Only). The Time/Date Table carries a UTC time in the stream, which is set to a starting value when the stream is generated. It is then continually updated throughout the stream to reflect the passing of time. The default setting of the initial value will be the time the generation is started, but this can be changed to any user defined value.

To edit the Time/Date Table parameters, highlight the **Time/Date Table** node and select **Properties**… form the right-click menu. The Time/Date Table Properties dialog box is displayed.





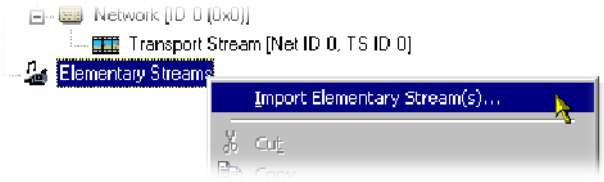
Cycle Time gives the frequency at which the time and date information should be repeated in the generated stream.

Elementary Streams and Programs

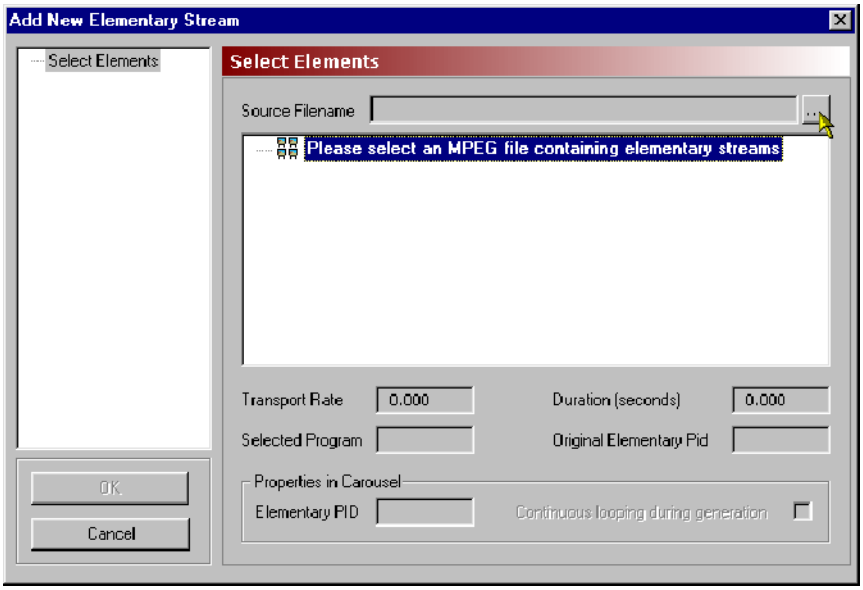
Audio and video elementary can be imported and incorporated into the generated stream. Subsequently, the imported streams can be associated with one or more programs.

Importing Elementary Streams.

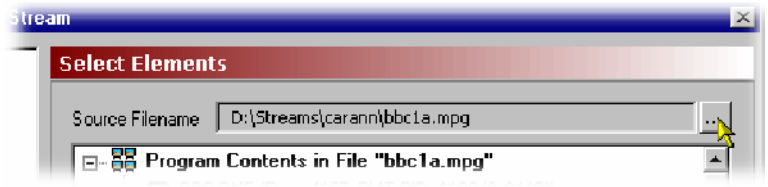
1. In the Programs view, highlight the **Elementary Streams** node and select **Import Elementary Stream(s)**… from the right-click menu.



The **Add New Elementary Stream** dialog box is displayed:



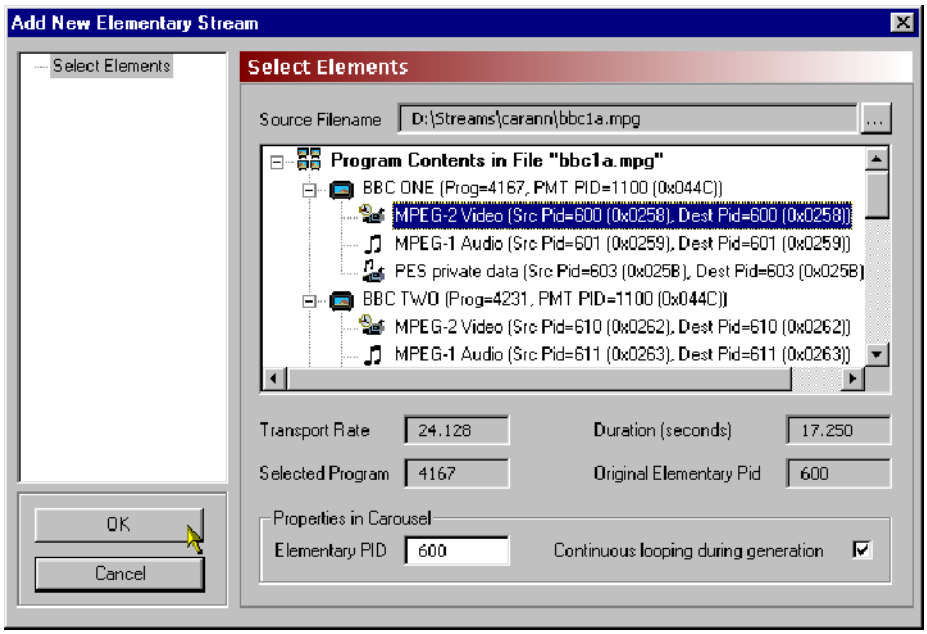
2. Use the browse button to select the source file (mpg) from which the elementary streams are to be imported:



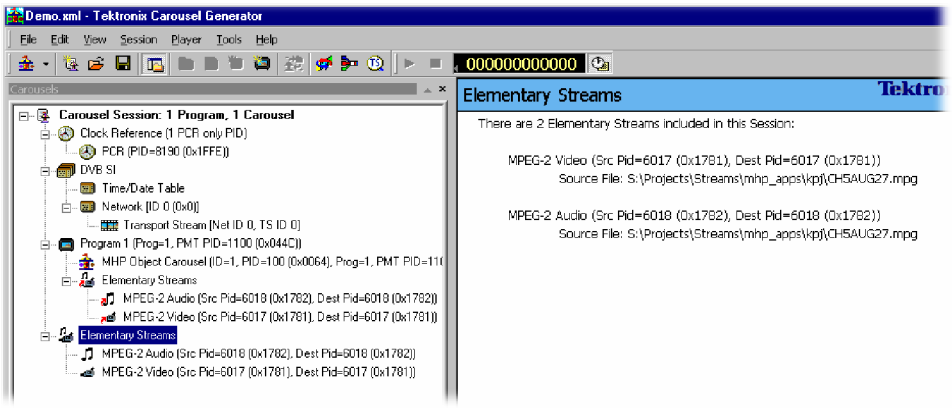
All programs in the source file are displayed, but only one program, or the elementary streams from one program, can be imported into a session.

3. Highlight the program or elementary stream(s) to be imported.

Select **OK** to import the program/stream(s).



Note that selected elementary streams are displayed under the **Elementary Streams** node in the Programs view.


Demo.xml - Tektronix Carousel Generator
File Edit View Session Player Tools Help
000000000000
Carousels
Carousel Session: 1 Program, 1 Carousel
Clock Reference (1 PCR only PID)
PCR (PID=8190 (0x1FFE))
DVB SI
Time/Date Table
Network (ID 0 (0x0))
Transport Stream (Net ID 0, TS ID 0)
Program 1 (Prog=1, PMT PID=1100 (0x044C))
MHP Object Carousel (ID=1, PID=100 (0x0064), Prog=1, PMT PID=11
Elementary Streams
MPEG-2 Audio (Src Pid=6018 (0x1782), Dest Pid=6018 (0x1782))
MPEG-2 Video (Src Pid=6017 (0x1781), Dest Pid=6017 (0x1781))
Elementary Streams
MPEG-2 Audio (Src Pid=6018 (0x1782), Dest Pid=6018 (0x1782))
MPEG-2 Video (Src Pid=6017 (0x1781), Dest Pid=6017 (0x1781))
Elementary Streams
Tektro
There are 2 Elementary Streams included in this Session:
MPEG-2 Video (Src Pid=6017 (0x1781), Dest Pid=6017 (0x1781))
Source File: S:\Projects\Streams\mhp_apps\kpj\CH5AUG27.mpg
MPEG-2 Audio (Src Pid=6018 (0x1782), Dest Pid=6018 (0x1782))
Source File: S:\Projects\Streams\mhp_apps\kpj\CH5AUG27.mpg

Elementary Stream Properties. Imported elementary streams are allocated to the same PID used in the source program. If there is any conflict with existing PIDs in the session, a warning is displayed and an opportunity offered to make changes.

The elementary stream properties dialog box allows the PID to be changed. A warning will be displayed if a conflict with an existing PID occurs. Continuous looping of the stream during generation can also be enabled.

To select the Elementary Stream Properties dialog box, highlight the elementary stream and select **Elementary Stream Properties** from the right-click menu.

Linking Elementary Streams to Programs. When a carousel is created, a Program node is automatically created. If the Carousel Wizard is used, elementary streams can be added during the process. Streams can also be added from a selected program as required.

Streams are added to the Program node(s) by dragging and dropping them from the Elementary Stream node. Note that in this case, they are simply linked to the Elementary Stream entry; if they are deleted from the program, they will continue to be listed under the Elementary Stream node. However, if an elementary stream is deleted from the Elementary Streams node, it will also be deleted from the programs in which it is used.

Note also that the Elementary Streams Properties dialog box (when accessed via the Program entry) allows descriptors to be added to the elementary stream information loop in the PMT.

Output Stream Generation

To start generating the output stream, select **Player > Start Playout**. The parameters used are part of the Stream Generation properties (page 7–40).

Errors occurring during stream generation are reported in the **TS Generation** tab of the Log view.

Carousel Definition File

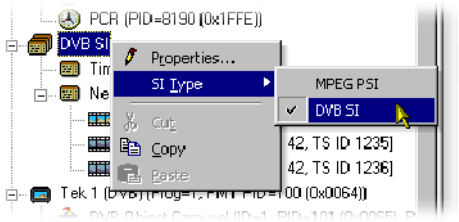
The current state of the carousel generator session can be saved to disk at any time during the creation process using the **File > Save Carousel Session** or **File > Save Carousel Session As**… options. This can then be reloaded at any time using the **File > Open Carousel Session**… option. The format of the saved file is standard XML and can be viewed in any XML compatible viewer (for example, Internet Explorer 5 and up); editing the XML file is not recommended. Errors in the syntax of the XML file will be reported in the Definition File Syntax tab of the Log view; errors are summarized on the Summary tab of the Log view.

PSI and SI in the Carousel Generator Output Stream

The Carousel Generator creates various PSI and SI tables while generating its output stream. The exact contents of the PSI and SI depends on many user settings; this section describes most of the auto-generated content and which options or properties affect that content. Note that all PSI/SI related properties can be accessed through nodes in the program tab.

PSI/SI Mode Settings

There is one field that has a huge effect on the PSI and SI tables that Carousel Generator produces – the Session's 'PSI/SI type' field. This can be accessed from the Stream Generation Properties dialog box (**Player > Stream Generation Properties**), or by right-clicking on the SI node in the program tab, selecting the **SI Type** sub-menu, and selecting one of the two options.



MPEG PSI — PAT, PMT, and AIT (for MHP carousels) will be generated.

DVB SI — In addition to the standard MPEG tables, Carousel Generator will output NIT actual, SDT actual, EIT present/following actual and TDT sections.

MPEG PSI tables

Table 7-11: Program Association Table (PAT)

Table Syntax	CG Value	Comment
program_association_section() {		
table_id	0x00	
section_syntax_indicator	1	
'0'	0	
reserved	0x3	
section_length	auto	
transport_stream_id	user	SI node > Properties… > (MPEG SI page) 'Transport Stream ID' field.
reserved	0x3	
version_number	0	CG does not support table versioning.
current_next_indicator	1	
section_number	auto	depends on the number of programs.
last_section_number	auto	depends on the number of programs.
for (i=0; i<n; i++) {		
program_number	user	Program node > Properties… > (PMT entry page) 'Program Number' field.
reserved	0x7	
if (program_number == 0) {		CG does not specify the network PID.
network_PID	n/a	13818-1 describes it as 'optional'.
}		
else {		
program_map_PID	user	Program node > Properties… > (PMT entry page) 'PMT PID' field.
}		
}		
CRC_32	auto	
}		
(ISO/IEC 13818-1 (Systems) section 2.4.4.3)		

Table 7-12: Program Map Table (PMT)

Table Syntax	CG Value	Comment
TS_program_map_section() {		
table_id	0x02	
section_syntax_indicator	1	
'0'	0	
reserved	0x3	
section_length	auto	
program_number	user	Program node > Properties… > (PMT entry page) 'Program Number' field.
reserved	0x3	
version_number	0	CG does not support table versioning.
current_next_indicator	1	
section_number	0	
last_section_number	0	
reserved	0x7	
PCR_PID	user	Program node > Properties… > (PMT entry page) 'PCR PID' dropdown menu.
reserved	0xF	
program_info_length	auto	
for (i=0; i<program_info_length; i++) {		
descriptor()	auto + user	Auto generation depends on carousel type. See 'carousel descriptors' note below. User can add additional descriptors via Program node > Properties… > (Program Descriptors page)
}		
for (i=0; i<N1; i++) {		Carousel Generator will add elementary streams as required. Streams include carousel data, AITs, and imported PIDs.
stream_type	auto	Stream type 11 for carousel data, stream type 5 for AIT data, and the source stream type of any imported PIDs.
reserved	0x7	
elementary_PID	user	User editable – edit method depends on the type of stream.
reserved	0xF	
ES_info_length	auto	
for (i=0;i<N2;i++) {		
descriptor()	auto + user	Auto generation depends on stream type and carousel type.

Table 7-12: Program Map Table (PMT) (Cont.)

Table Syntax	CG Value	Comment
}		
}		
CRC_32	auto	
}		
(ISO/IEC 13818-1 section 2.4.4.8)		

Carousel Descriptors in the PMT

The various standards supported by the Carousel Generator have differing signaling requirements, so the type and content of descriptors added to the PMT depend on the carousel types contained in a program.

DSM-CC Object Carousels (ISO/IEC 13818-6 defined). The basic 13818-6 standard only supports a single carousel per program, and requires that a carousel_identifier_descriptor be inserted in the program_info loop (first descriptor loop) of the PMT section for a program carrying a DSM-CC carousel.

Table 7-13: DSM-CC object carousels - Carousel identifier descriptor

Descriptor Syntax	CG Value	Comment
carousel_identifier_descriptor {		
descriptor_tag	0x13	
descriptor_length	auto	
carousel_identifier	user	Carousel node > Properties… > (General) Carousel ID
for (n=0; n<N; n++) {		
private_data_byte	n/a	These bytes are not used when signaling
}		a basic DSM-CC Object Carousel
}		
(ISO/IEC 13818-6 (Extensions for DSM-CC) section 11.4.1)		

DSM-CC Object Carousels are carried on one or more PIDs referenced by the PMT with stream type 11. The ES_info loop for each of these streams contains an association_tag_descriptor which maps the association_tag used by DSM-CC messages to a particular PID.

Table 7-14: DSM-CC object carousels - Association tag descriptor

Descriptor Syntax[4]	CG Value	Comment
association_tag_descriptor {		
descriptor_tag	0x14	
descriptor_length	auto	
association_tag	user	Carousel node > Properties… > (PID Settings) Association tag
use	auto	0 if the PID is used for a DSI, 1 otherwise
selector_byte_length	auto	
for (n=0; n<N1; n++) {		
selector_byte	auto	not used if 'use' is 1, otherwise follows the use_0_selector_bytes format
}		
for (n=0; n<N2; n++) {		
private_data_byte	n/a	not used
}		
}		
use_0_selector_bytes {		
transaction_id	auto	Matches the transaction id of the DSI
timeout	0xFFFFFFFF	timeout unknown
}		
(ISO/IEC 13818-6 section 11.4.2)		

DVB Object Carousels (ETSI EN 301 192 defined). Although not mentioned in the DVB data standard (ETSI EN 301 192: Specification for the transmission of data services in DVB bitstreams), the DVB implementation guidelines for data broadcasting allow support for multiple Object Carousels per program, by allowing the carousel_identifier_descriptor to be transmitted in the second descriptor loop of the PMT.

"DVB Guideline: The carousel_identifier_descriptor() shall be inserted in the second descriptor loop of the PMT (ES_info) corresponding to the elementary stream carrying the DSI of the object carousel. This allows more than one object carousel per MPEG-program and implicitly identifies the PID on which each carousel should be booted from."
(TR 101 202 (Implementation Guidelines for Data Broadcasting) section 4.7.7.1)

Carousel Generator therefore transmits a carousel_identifier_descriptor for every DVB Object Carousel in a program, as specified by this implementation guideline.

DVB also extends the carousel_identifier_descriptor slightly, by defining the contents of the private_data_byte section further with what it calls a FormatSpecifier. However, CarouselGenerator only uses the required parts of this extension - it sets the FormatId to zero, which indicates that no format specifier is provided.

Table 7-15: DVB object carousels - Private_data_byte syntax

Private_data_byte syntax	CG Value	Comment
carousel_identifier::private_data_bytes {		
FormatId	0	0 indicates no FormatSpecifier present
FormatSpecifier() {		
FormatSpecifier_byte	n/a	Not used by Carousel Generator
}		
for (n=0; n<N1; n++) {		
private_data_byte	n/a	Not used by Carousel Generator
}		
}		
TR 101 202 (Implementation Guidelines for Data Broadcasting) section 4.7.7.1		

An association_tag_descriptor is added to the ES_info loop in exactly the same way as for DSM-CC object carousels.

Two more descriptors are also added to the ES_info loop for streams carrying DVB object carousels – the data_broadcast_id_descriptor and the stream_identifier_descriptor. Both are defined in EN300 468 (Specification for Service Information in DVB systems).

Table 7-16: DVB object carousels - Descriptors

Descriptor Syntax	CG Value	Comment
stream_identifier_descriptor {		
descriptor_tag	0x52	
descriptor_length	1	
component_tag	user	LSB of the association_tag for this stream
}		
data_broadcast_id_descriptor {		
descriptor_tag	0x66	
descriptor_length	2	

Table 7-16: DVB object carousels - Descriptors (Cont.)

Descriptor Syntax	CG Value	Comment
data_broadcast_id	7	DVB Object Carousel code
for (i=0; i<N; i++) {		
id_selector_byte	n/a	DVB Object Carousels do not use these
}		selector bytes
}		

DTT Object Carousels (DTG D-Book (DTT Requirements for Interoperability)). Most of the PMT signaling for DTT Object Carousels is the same as for DVB Object Carousels. However, the D-Book does specify the contents of the id_selector_byte section of the data_broadcast_id_descriptor, and also requires that the data_broadcast_id value in that descriptor is 262 (0x106).

Table 7-17: DTT object carousels

DTT id_selector_bytes Syntax	CG Value	Comment
for (i=0; i<descriptor_length-2; i++) {		
application_type_code	user	DTT Object Carousel node > Properties… > (DTT Applications page). Application codes list contains the app codes used.
boot_priority_hint	user	Boot priorities accessed as above.
app_specific_data_length (N2)	0	
for (j=0; j<N2; j++) {		
app_specific_data_byte	n/a	Not used.
}		
}		
(UK DTG D-Book (Digital Terrestrial Television Requirements for Interoperability) section 18.5.2.1)		

MHP Object Carousels (ETSI TS 101 812). MHP uses an additional table, the AIT, for most of its signaling requirements. The location of the AIT table for a program is identified through an elementary stream PID entry in the PMT with stream type 5. The ES_info loop for the AIT PID also carries an application_signaling descriptor (AIT information is given in the DVB SI Tables section of this appendix):

Table 7-18: MHP object carousels - Application signaling

Descriptor Syntax	CG Value	Comment
application_signaling_descriptor {		
descriptor_tag	0x6F	
descriptor_length	auto	
for (i=0; i<descriptor_length; i++) {		
application_type	auto	An entry for application_type 1 will be present if any Java apps are defined in the carousel, and an entry for type 2 will be present if any HTML apps are defined in the carousel.
reserved_future_use	0x7	
AIT_version_number	0	CG does not support table versioning – all tables have version number 0.
}		
}		
(ETSI TS 101 812 (Multimedia Home Platform (MHP) specification) section 10.7.1)		

The PMT signaling for MHP carousel carrying streams is very similar to that for DVB Object Carousels. The only difference is that, like DTT, MHP defines additional content for the data_broadcast_id_descriptor's data_broadcast_id value and id_selector bytes. The MHP data_broadcast_id value is 240 (0xF0), and the id_selector bytes are as defined below:

Table 7-19: MHP object carousels - ID selector

MHP id_selector_bytes Syntax	CG Value	Comment
for (i=0; i<descriptor_length-2; i++) {		
application_type	auto	An entry for application_type 1 will be present if any Java apps are defined in the carousel, and an entry for type 2 will be present if any HTML apps are defined in the carousel.
(ETSI TS 101 812 section 10.7.2.2)		

DVB SI Tables

The following SI is only generated when the session's SI type is set to DVB SI. All user-editable properties of these tables can be accessed through nodes in the Programs tab.

Network Information Table (NIT)

The Carousel Generator only generates NIT actual sections, and the contents of the NIT can be accessed by editing the properties of the Network node and its children.

Table 7-20: Network information table

Table Syntax	CG Value	Comment
network_information_section() {		
table_id	0x40	NIT actual – CG does not generate NIT other sections.
section_syntax_indicator	1	
reserved_future_use	1	
reserved	0x3	
section_length	auto	
network_id	user	Network node > Properties… > 'Network ID' field
reserved	0x3	
version_number	0	CG does not support table versioning
current_next_indicator	1	
section_number	auto	
last_section_number	auto	
reserved_future_use	0xF	
network_descriptors_length	auto	
for (i=0;i<N;i++) {		A network_name_descriptor will always be added, with the name
descriptor()	auto + user	Specified in the Network Properties > 'Name' field.
}		The user can add custom descriptors to this loop by editing the descriptor list in the Network Properties dialog box.
reserved_future_use	0xF	
transport_stream_loop_length	auto	
for (i=0; i<N; i++) {		CG will always add at least one transport stream to this loop (the 'actual' transport stream' but the user can add additional transport streams (by right-clicking on the network node).
transport_stream_id	user	Transport Stream node > Properties… > (Transport Stream page) Transport Stream ID field

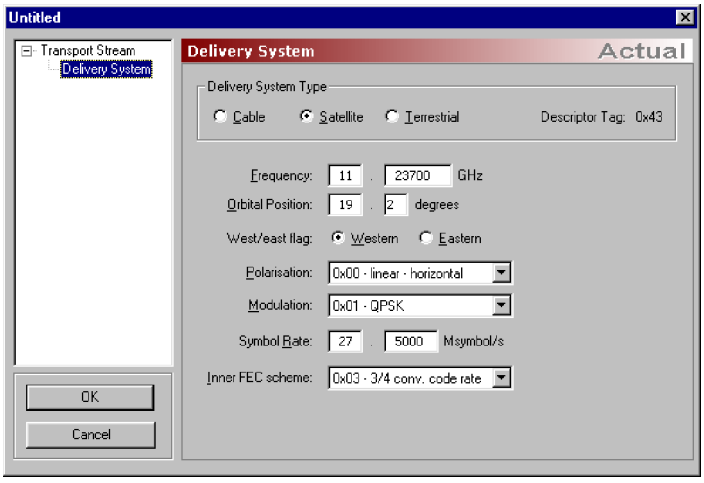
Table 7-20: Network information table (Cont.)

Table Syntax	CG Value	Comment
original_network_id	user	As above > Original Network ID field
reserved_future_use	0xF	
transport_descriptors_length	auto	
for (j=0; j<N; j++) {		One of the three delivery system descriptors will always be present (see 'Delivery System Descriptors' below)
descriptor()	auto + user	The user can also add custom descriptors via Transport Stream node > Properties… > (Transport Stream page) Descriptors list
}		
}		
CRC_32	auto	
}		
(ETSI EN 300 468 (Specification for Service Information in DVB systems) section 5.2.1)		

Delivery System Descriptors

Every transport stream listed in the NIT will contain at least one descriptor – one of either the cable delivery system descriptor (ETSI EN 300 468 section 6.2.12.1), the satellite delivery system descriptor (ETSI EN 300 468 section 6.2.12.2) or the terrestrial delivery system descriptor (ETSI EN 300 468 section 6.2.12.3). The type of descriptor used, and the contents of all its fields, are edited through the Transport Stream node **> Properties**… **> Delivery System** page.

All of the delivery system descriptor fields defined in EN 300 468 can be modified.



Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

Service Description Table (SDT)

Table 7-21: Service Description Table (SDT)

Table Syntax	CG Value	Comment
service_description_section() {		
table_id	0x42	SDT actual – CG does not generate SDT other sections.
section_syntax_indicator	1	
reserved_future_use	1	
reserved	0x3	
section_length	auto	
transport_stream_id	user	Matches the transport_stream_id of the actual transport stream
reserved	0x3	
version_number	0	CG does not support table versioning
current_next_indicator	1	
section_number	auto	
last_section_number	auto	
original_network_id	user	Matches the original_network_id of the actual transport stream
reserved_future_use	0xFF	
for (i=0; i<N; i++) {		CG auto-generates an entry for every program in the session.
service_id	auto	Matches the program number
reserved_future_use	0x3F	
EIT_schedule_flag	0	EIT schedule tables not supported.
EIT_present_following_flag	user	Transmission of an EIT_pf is user-controllable per service. See the EIT section below.
running_status	0x4	Always set to 4 – Running
free_ca_mode	0	Always set to 0 – No scrambling
descriptors_loop_length	auto	
for (j=0; j<N; j++) {		
descriptor()	auto	A service_descriptor is always added, and depending on the carousel content of the program, data_broadcast_ descriptor(s) may be added.
}		
}		
CRC_32	auto	
}		
(ETSI EN 300 468 section 5.2.3)		

Service_descriptor

Table 7-22: Service descriptor

Descriptor Syntax	CG Value	Comment
service_descriptor() {		All of the properties in this descriptor are accessed via the Program node that is associated with the service. Program node > Properties… > Additional SI page
descriptor_tag	0x48	
descriptor_length	auto	
service_type	user	> Service Type dropdown
service_provider_name_length	auto	
for (i=0; i<N; i++) {		
char	user	> Service Provider field
}		
service_name_length	auto	
for (i=0; i<N; i++) {		
char	user	> Service Name field
}		
}		
(ETSI EN 300 468 section 6.2.30)		

Data_broadcast_ descriptor

The data_broadcast_descriptor is a DVB defined descriptor that can be used in either the SDT or EIT to indicate that a carousel is associated with a service or event. Carousel Generator only supports associating a carousel with a service, so will only add the data_broadcast_descriptor to the SDT.

Table 7-23: Data broadcast descriptor

Descriptor Syntax	CG Value	Comment
data_broadcast_descriptor() {		
descriptor_tag	0x64	
descriptor_length	auto	
data_broadcast_id	auto	depends on the type of carousel
component_tag	user	LSB of the assoc_tag of the PID carrying the carousel's DSI
selector_length	auto	
for (i=0; i<selector_length; i++) {		
selector_byte	auto	depends on the type of carousel

Table 7-23: Data broadcast descriptor (Cont.)

Descriptor Syntax	CG Value	Comment
}		
ISO_639-2[3]_language_code	"und"	CG does not use the text field, so the language code is set to "und"efined
text_length	0	
for (i=0; i<text_length; i++) {		
text_char	n/a	Not used
}		
}		
(ETSI EN 300 468 section 6.2.10)		

The use of the data_broadcast_descriptor, and the contents of the data_broadcast_id and selector_bytes fields depend on the type of carousel(s) in the program.

DSM-CC Object Carousel. The DSM-CC standard does not define the data_broadcast_descriptor, and so a data_broadcast_descriptor is not added to the service entry for a program containing a DSM-CC object carousel.

MHP Object Carousels. MHP uses the AIT for all its signaling requirements, and so does not require the use of the data_broadcast_descriptor.

DVB Object Carousels. A data_broadcast_descriptor is added for every DVB Object Carousel contained in a program. The data_broadcast_id is set to 7, and the selector_byte format is as follows:

Table 7-24: DVB object carousel

DVB selector_bytes Syntax	CG Value	Comment
Carousel_type_id	0x2	
Reserved	0x3F	
Transaction_id	auto	Matches the carousel DSI transaction ID
time_out_value_DSI	0xFFFFFFFF	not used
time_out_value_DII	0xFFFFFFFF	not used
Reserved	0x3	
leak_rate	0	
for (i=0; i<N; i++) {		

Table 7-24: DVB object carousel (Cont.)

DVB selector_bytes Syntax	CG Value	Comment
ISO_639_language_code	n/a	The object names loop is not used by the Carousel Generator.
object_name_length	n/a	
for (j=0; j<object_name_length; j++) {		
object_name_char	n/a	
}		
}		
(ETSI EN 300 468 section 6.2.10)		

DTT Object Carousels. The DTG D-Book requires that there only be a single data_broadcast_descriptor per service, to identify the application type carried in that service. The Carousel Generator uses the first Carousel it encounters in a program that has at least one application id set as the carousel referenced by the data_broadcast_descriptor. Generally, only one of the DTT Object Carousels in a program should have any application IDs set.

Because only a single data_broadcast_descriptor is allowed per service, the component_tag value of the descriptor is set to zero – the descriptor does not identify any particular stream as carrying a carousel.

The data_broadcast_id for the descriptor is set to 262 (0x106), and the selector_bytes format is as follows:

Table 7-25: DTT object carousel

DTT selector_bytes Syntax	CG Value	Comment
for (i=o; i<selector_byte_length;i++) {		
application_type_code	user	The first application id defined in a DTT carousel contained in the service.
number_languages	0	
for (j=0; j<number_languages;j++) {		
ISO_639_language_code	n/a	Not used
}		
application_specific_data_length	0	
for (j=0; j<a_s_d_length; j++) {		
application_specific_data_byte	n/a	Not used
}		

Table 7-25: DTT object carousel (Cont.)

DTT selector_bytes Syntax	CG Value	Comment
}		
(UK DTG D-Book section)		

Event Information Table (EIT)

The Carousel Generator only supports the creation of EIT present following information, for the actual transport stream. The presence of EIT p/f sections for a particular service is user controllable, but where transmitted, information will only be included for the present (now) event. The following (next) event section will always be empty. If an EIT p/f is present for a particular service, the relevant EIT_present_following_flag in the SDT will be set.

Table 7-26: Event Information Table (EIT)

Table Syntax	CG Value	Comment
service_description_section() {		
table_id	0x4E	EIT actual present/following – CG does not generate any other form of EIT.
section_syntax_indicator	1	
reserved_future_use	1	
reserved	0x3	
section_length	auto	
service_id	auto	
reserved	0x3	
version_number	0	CG does not support table versioning
current_next_indicator	1	
section_number	auto	section 0 is present event, 1 is following event
last_section_number	1	
transport_stream_id	user	Matches the transport_stream_id of the actual transport stream
original_network_id	user	Matches the original_network_id of the actual transport stream
segment_last_section_number	1	p/f table is not segmented
last_table_id	0x4E	Only table id 0x4E is used
for (i=0; i<N; i++) {		The present event section (section 0) will always contain a single event, while the following event section (section 1) will not contain any events. The following fields are therefore only used in section 0 of the EIT.
event_id	0	Event ID is always set to zero

Table 7-26: Event Information Table (EIT) (Cont.)

Table Syntax	CG Value	Comment
start_time	user	The start time will match the start time of the TDT.
duration	99:59:59	
running_status	0x4	Always set to 4 – Running
free_CA_mode	0	Always set to 0 – No scrambling
descriptors_loop_length	auto	CG always adds a single descriptor
for (i=0; i<N; i++) {		to the event descriptors loop, the
descriptor()	auto	short_event_descriptor.
}		
}		
CRC_32	auto	
}		
(ETSI EN 300 468 section 5.2.4)		

Short_event_descriptor

The fields of the short_event_descriptor for the present event are all accessed through Program Node **> Properties**… **> Additional SI** page. This page also contains the checkbox (**Include EIT present/following section for this service**) that controls whether an EIT will be transmitted for a particular service.

Table 7-27: Short event descriptor

Descriptor Syntax	CG Value	Comment
short_event_descriptor() {		
descriptor_tag	0x4D	
descriptor_length	auto	
ISO_639-2[3]_language_code	user	> Language Code dropdown
event_name_length	auto	
for (i=0; i<event_name_length;i++) {		
event_name_char	user	Set to match the service name field
}		
text_length	auto	
for (i=0; i<text_length; i++) {		
text_char	user	> Description field
}		
}		
(ETSI EN 300 468 section 6.2.33)		

Time and Date Table (TDT)

The TDT is accessed through the Time/Date Table node under the DVB SI node in the program tab. It carries current time information, and the user can specify whether that information will be filled with the current system time, or start at a time specified by the user and increment in real time.

Table 7-28: Time and date table

Table Syntax	CG Value	Comment
time_date_section() {		
table_id	0x70	
section_syntax_indicator	0	
reserved_future_use	1	
reserved	0x3	
section_length	5	
UTC_time	auto/user	This value starts at the time specified by the user (Time/Date Table node > Properties… > Start Time) and increments appropriately during stream output.
}		
(ETSI EN 300 468 section 5.2.4)		

Application Information Table (AIT)

The AIT (ETSI TS 101 812 section 10.4) is the main signaling component of the MHP standard, and the Carousel Generator will generate an AIT for every program that carries one or more MHP carousels containing applications. Note that if the MHP carousel(s) in a program do not have any applications defined an AIT will not be generated for that program.

The AIT is split into subtables based on the application_type value. The current MHP spec defines two application types, Java and HTML, and Carousel Generator supports both. If only Java applications are present in the carousels in a program, only the Java subtable will be generated, and the same is true for HTML applications. If both application types are present in the carousel(s) in a program, both subtables of the AIT will exist for that program.

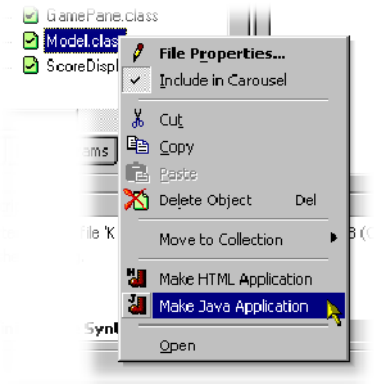


Table 7-29: Application information table

Table Syntax	CG Value	Comment
application_information_section() {		
table_id	0x74	
section_syntax_indicator	1	
reserved_future_use	1	
reserved	0x3	
section_length	auto	
application_type	auto	
reserved	0x3	
version_number	0	CG does not support table versioning
current_next_indicator	1	
section_number	auto	
last_section_number	auto	
reserved_future_use	0xF	
common_descriptors_length	0	
for (i=0; i<c_d_length; i++) {		
descriptor()	n/a	
}		
DVB_reserved_future_use	0xF	
application_loop_length	auto	
for (i=0; i<app_loop_length; i++) {		Carousel Generator will add applications as defined in the carousel. To create an application, right-click on the file and select Make HTML Application or Make Java Application.
application_identifier() {		
organisation_id	user	File node > Properties… > (Application Descriptor page) Organisation ID field

Table 7-29: Application information table (Cont.)

Table Syntax	CG Value	Comment
application_id	user	File node > Properties… > (Application Descriptor page) Application ID field
}		
application_control_code	user	File node > Properties… > (Application Descriptor page) Control Code dropdown
app_descriptors_loop_length	auto	
for (j=0; j<a_d_l_length; j++) {		
descriptor()	auto/user	Carousel Generator creates the appropriate descriptors for each application type automatically. However, fields in the properties pages allow the contents of these descriptors to be edited. See 'application descriptors' note below.
}		
}		
CRC_32	auto	
}		

Application Descriptors in the AIT

Every application listed in the AIT will have five descriptors in the app_descriptors_loop, but two of these depend upon the type of application (Java or HTML). The three common descriptors are the application_descriptor, application_name_descriptor and transport_protocol_descriptor, and the two app specific descriptors will either be dvb_j_application_descriptor and dvb_j_application_location_descriptor (for Java apps) or dvb_html_application_descriptor and dvb_html_application_location_descriptor (for HTML apps).

Common Application Descriptors.

Table 7-30: Application descriptor

Descriptor Syntax	CG Value	Comment
application_ descriptor {		Note. All of the user editable fields are accessed through File > Properties… > Application Descriptor page
descriptor_tag	0x00	
descriptor_length	auto	
application_profiles_length		
for (i=0; i<N; i++) {		> Application profiles list
application_profile	user	
version.major	user	

Table 7-30: Application descriptor (Cont.)

Descriptor Syntax	CG Value	Comment
version.minor	user	
version.micro	user	
}		
service_bound_flag	user	> Service Bound checkbox
visibility	user	> Visibility dropdown
reserved_future_use	0x1F	
application_priority	user	> Priority
for (i=0; i<N; i++) {		
transport_protocol_label	auto	Matches the transport_protocol_label value in the transport_protocol_descriptor.
}		
}		
(ETSI TS 101 812 section 10.7.3)		

Table 7-31: Application name descriptor

Descriptor Syntax	CG Value	Comment
application_name_descriptor {		Accessed through the same page as described.
descriptor_tag	0x01	
descriptor_length	auto	
for (i=0; i<descriptor_length; i++) {		
ISO_639_language_code	user	> Language Code dropdown
app_name_length	auto	
for (i=0; i<a_n_length;i++){		
app_name_char	user	> Application Name field
}		
}		
}		
(ETSI TS 101 812 section 10.7.4)		

Table 7-32: Transport protocol descriptor

Descriptor Syntax	CG Value	Comment
transport_protocol_descriptor {		
descriptor_tag	0x02	
descriptor_length	auto	
protocol_id	0x0001	Transport via OC
transport_protocol_label	auto	Set to match the component tag value
remote_connection	0	CG does not support remote carousels
component_tag	auto	Matches the component tag in the stream_identifier_descriptor for the DSI of the MHP Object Carousel that contains this application.
}		
(ETSI TS 101 812 section 10.8.1)		

Java Application Descriptors.

Table 7-33: Java application descriptor

Descriptor Syntax	CG Value	Comment
dvb_j_application_descriptor {		This descriptor specifies the Java application parameters, and is accessed on the Java app file > Properties… > Java Properties page. The parameter list is edited by using the Parameters list box and buttons.
descriptor_tag	0x03	
descriptor_length	auto	
for (i=0; i<N; i++) {		
parameter_length	auto	
for (j=0; j<parameter_length; j++) {		
parameter_byte	user	
}		
}		
}		
(ETSI TS 101 812 section 10.9.1)		

Table 7-34: Java application location descriptor

Descriptor Syntax	CG Value	Comment
dvb_j_application_location_descriptor {		This descriptor specifies the Java application path, and is accessed via Java app file > Properties… > Java Properties page.
descriptor_tag	0x04	
descriptor_length	auto	
base_directory_length	auto	
for (i=0; i<base_directory_length; i++) {		
base_directory_byte	user	> Base Directory field
}		
classpath_extension_length	auto	
for (i=0; i<classpath_ext_length; i++) {		
classpath_extension_byte	user	> Classpath extension field
}		
for (i=0; i<N; i++) {		
initial_class_byte	user	> Initial class field
}		
(ETSI TS 101 812 section 10.9.2)		

HTML Application Descriptors.

Table 7-35: HTML application descriptor

Descriptor Syntax	CG Value	Comment
dvb_html_application_descriptor {		This descriptor specifies the HTML application parameters, and is accessed via HTML app file > Properties… > HTML Properties page.
Descriptor_tag	0x03	
descriptor_length	auto	
appid_set_length	auto	
for (i=0; i<appid_set_length; i++) {		
application_id	user	> Application IDs list box
}		
for (j=0; j<N; j++) {		
parameter_bytes	auto	> Parameter String edit box
}		

Table 7-35: HTML application descriptor (Cont.)

Descriptor Syntax	CG Value	Comment
}		
(ETSI TS 101 812 section 10.10.1)		

***NOTE**. The dvb_html_application_descriptor format shown above is that defined in TS 101 812 v1.1.2 (MHP v1.0.1) – previous versions of the standard did not have the application_id loop. Carousel Generator can be made to revert to the older version of the descriptor (v1.0.0) for a particular carousel by checking the **MHP Object Carousel** node **> Properties…** > (MHP page) **Use old style (MHP v1.0.0) HTML application descriptor** checkbox.*

Table 7-36: HTML application location descriptor

Descriptor Syntax	CG Value	Comment
dvb_html_application_location_descriptor {		This descriptor specifies the HTML application path, and is accessed on the HTML app file > Properties… > HTML Properties page.
descriptor_tag	0x04	
descriptor_length	auto	
physical_root_length	auto	
for (i=0; i<physical_root_length; i++) {		
physical_root_bytes	user	> Physical Root Directory field
}		
for (i=0; i<N; i++) {		
initial_path_bytes	user	> Initial Path field
}		
(ETSI TS 101 812 section 10.10.2)		

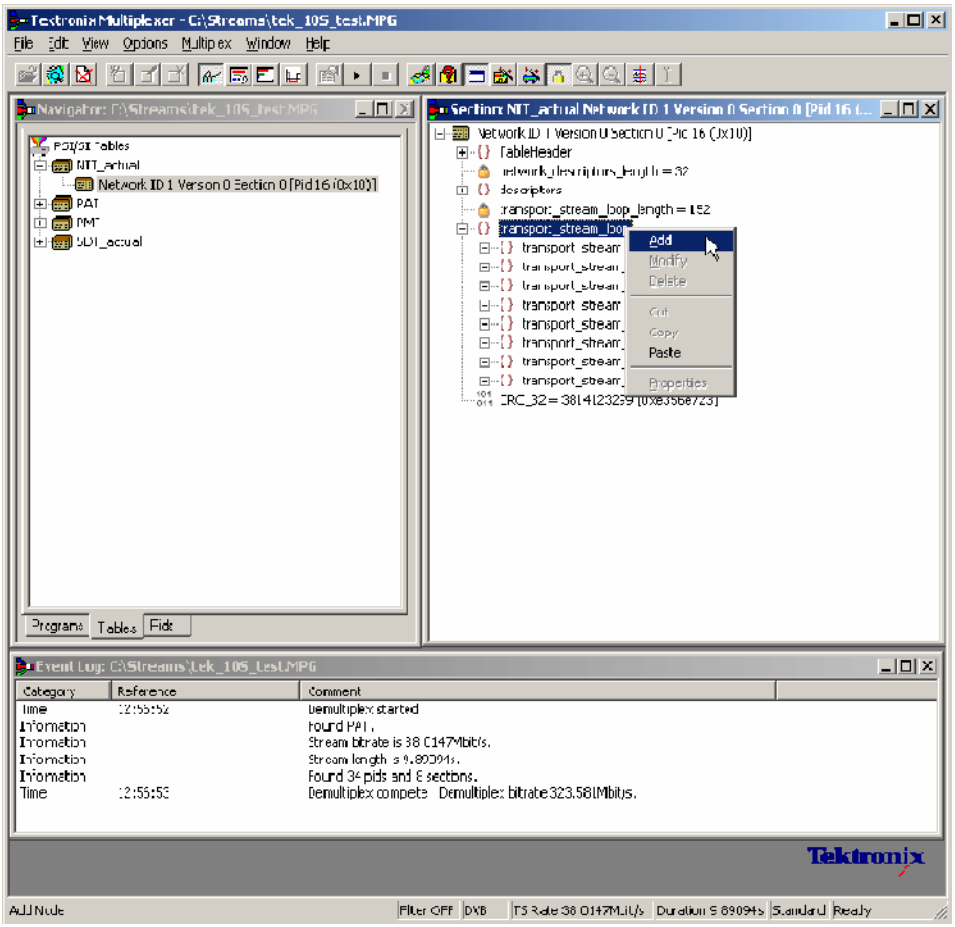
Summary

Carousel Generator v2.0 is designed to generate enough SI to create a fully DVB conformant stream, which should be enough to drive most set-top boxes. If any additional SI is required, another suitable tool should be used to insert the extra information into the generated stream.

Multiplexer

Getting Started

The Multiplexer provides off-line multiplexing of ATSC, MPEG-2 and DVB Transport Streams.



Transport streams (TS), elementary streams (ES), packetized elementary streams (PES), Packet Identifiers (PID) - all can be selected, manipulated and recombined to form customized, synthesized transport streams.

The functionality provided includes:

- Wizards that facilitate the completion of common tasks, such as populating streams with Program Specific Information/ Service Information/ Program and System Information Protocol (PSI/SI/PSIP) and programs.
- Table contents are displayed in and edited from structure diagrams (tree diagrams).

- Transport Streams that either conform strictly to the standards selected for interpretation or have precisely engineered, known, non-conformances.
- Two or more instances of Multiplexer can run concurrently. This allows table information to be copied from one file to another.
- The source data for non-conformant streams can be saved in a raw format, which can be quickly reloaded as the basis for generating more stream data.
- Conformance of edits to the standards is checked interactively and enforced by default. Checking and enforcement may be turned off when specifying non-conformances to be introduced into the new transport stream.

On opening, streams are analyzed and displayed according to the selected standard: MPEG, DVB, ATSC, or ISDB. Scripts are used by the analysis process; this allows private PSI/SI tables and descriptors to be defined.

***NOTE**. Most examples given in this section of the User Manual are based on DVB SI. You should remember that Multiplexer is equally at home with all major DTV standards, MPEG-2, DVB, ATSC, and ISDB as well as the major extensions to those standards.*

Program Specific Information (PSI), Service Information (SI), and Program and System Information Protocol (PSIP) are often referred to as simply SI in this section.

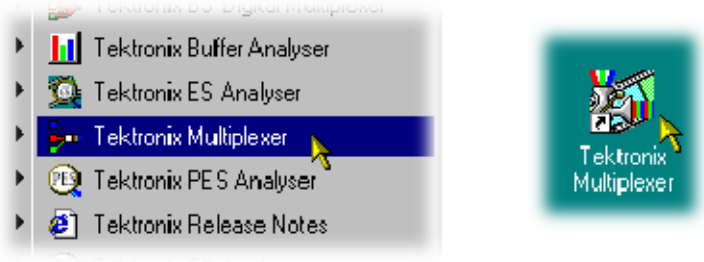
The Transport Stream Analyzer program should always be used for reliable analysis of transport streams containing DSM-CC or MPE addressable sections.

In the absence of TS Analyzer, it is acceptable to use Multiplexer for analysis, provided that the DSM-CC or MPE scripts are first applied using Expert mode in the Stream Interpretation dialog box (see Scripts*, page 8–5).*

However, when multiplexing streams containing DSM-CC or MPE addressable sections, the related scripts must not be active.

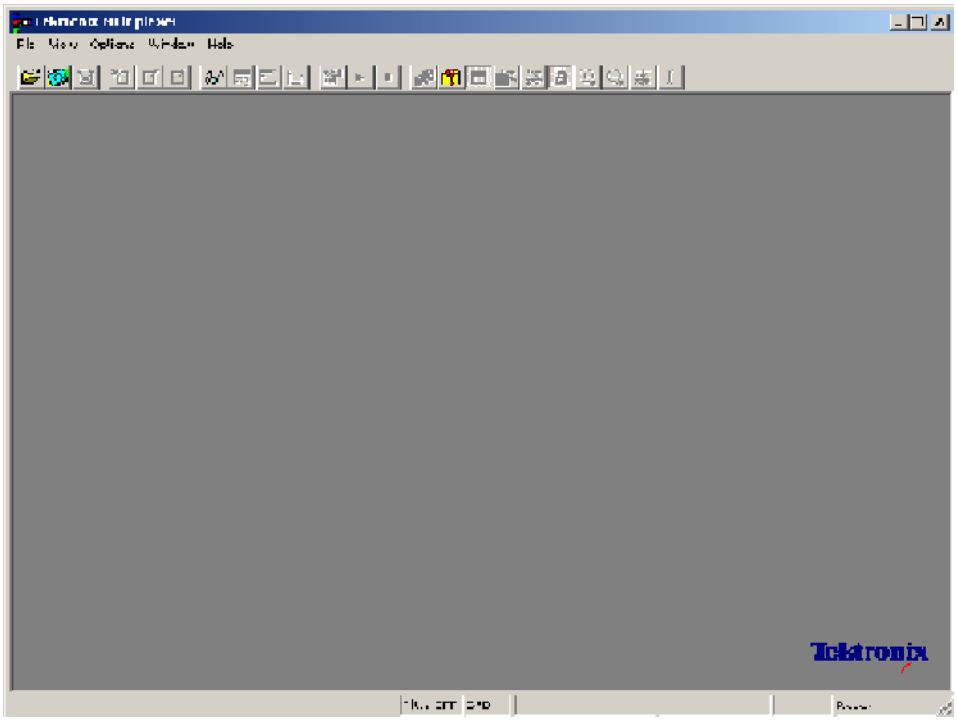
Starting the Program

The program can be started by selecting the Multiplexer option from the Start > Programs menu or by double-clicking on the Multiplexer Shortcut on the desktop.



Initial Appearance

Once the program has started and is ready for use, it will open a Main Window that looks as follows:



Use the View menu to select which standard will be used to interpret transport streams. Then open a transport stream file or import a multiplex configuration file.

Initial Menu Options

When the application is opened, users are presented with options relevant only to opening new or existing multiplex files. Options that are not relevant at this time are inactive (grayed out).

File Menu Options. Table 8–1 lists the options available in the initial File menu.

Table 8-1: File menu options

Command	Function
New	Opens new multiplex configuration file.
Open	Opens an MPEG file for use. The program opens the file selection dialog box allowing you to choose the required file.
Examine TS	Opens the Examine TS window, which allows a brief summary of the stream to be viewed before it is subjected to full analysis.
Close	(Currently disabled - see page 8–15.)
Import...	Opens a previously saved multiplex configuration file.
Export	(Currently disabled - see page 8–15.)
Export As	(Currently disabled - see page 8–15.)
1 <filename> 2 <filename> 3 <filename> 4 <filename>	A list of the four most recently used files. If the program has recently been installed the list may be empty or hold less than four files. Selecting a filename opens that file for use.
Exit	Finishes running the program.

View Menu Options. Table 8–2 lists the options available in the initial View menu.

Table 8-2: View menu options

Command	Function
Interpretation	Opens the Stream Interpretation dialog box. This allows the scripts to be used in stream analysis to be selected.
Event Log	Opens the Event Log window.
Toolbar	Displays or hides the Toolbar.
Status Bar	Shows or hides the Status Bar.

A check mark next to an option indicates that the object is currently visible.

Scripts

SI scripts are necessary to enable SI table and descriptor data to be analyzed successfully. Scripts are used to enable analysis of SI data dictated by the various international standards, for example, MPEG-2, DVB, ATSC, and ISDB.

Essential scripts are installed and enabled using the Stream Interpretation dialog box. In the absence of any enabled scripts, only the PAT table will be analyzed, all other data will be presented as private data.

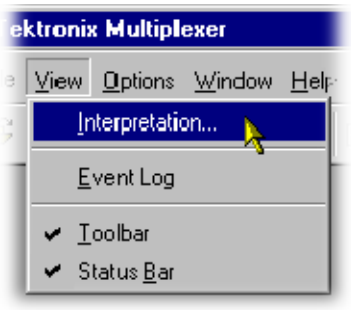
If a suitably configured script is selected and enabled before a stream is opened, custom data will be analyzed when the stream is opened. If the script is not selected or enabled, the stream will not fail to be analyzed, but any custom data will be reported as either an error in the stream configuration or as an elementary stream PID.

Scripts can only be selected and enabled when no files are open. The Stream Interpretation dialog box is available when a file is open, but all activity is disabled.

Note that a script file will not be used for analysis until:

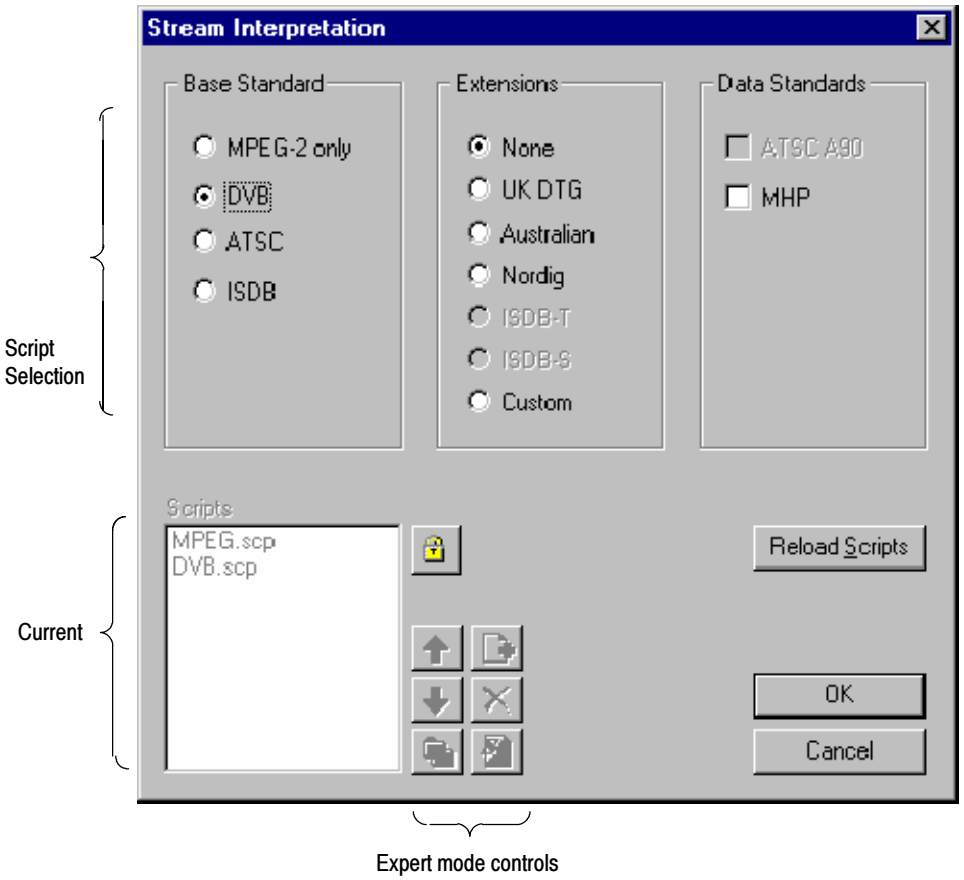
- It is present in the Scripts text-box in the current analysis mode.
- It is successfully enabled by closing the Stream Interpretation dialog box using the OK button.

Handling Scripts



To open the Stream Interpretation dialog box, with all files closed, select the Interpretation... option from the View menu.

The Stream Interpretation dialog box is displayed as shown below:



The top half of the dialog box is concerned with selecting scripts. The text box (Scripts) lists the scripts currently selected. The area adjacent to the text box is dedicated to Expert mode controls.

Script Selection

The selection area of the Stream Interpretation dialog box is best viewed and used from left to right.

The Base Standard section allows the MPEG, DVB or ATSC standard to be selected for analysis.

MPEG-2 only	Interprets and analyzes the packets in conformance to the MPEG-2 standards.
DVB	Interprets and analyzes the Transport Stream Packets according to the specifications of the DVB and MPEG-2 standards.

ATSC	Interprets and analyzes the Transport Stream Packets according to the specifications of the ATSC and MPEG-2 standards.
ISDB	Interprets and analyzes the Transport Stream Packets according to the specifications of the ISDB and MPEG-2 standards.

The standard selected will dictate the availability of the remaining options in the Extensions and Data Standards sections.

The Extensions section allows country-specific extensions to be added to the basic standard scripts. If None is selected, only the standard scripts are listed in the Scripts text box. The remaining country-specific extensions add extra scripts to the current listing. As with the Base Standard, the choice of Extensions option will dictate the availability of the options in the Data Standards section. The Custom selection in the Extensions section allows users to include their own selection of scripts using Expert Mode.

The Data Standards section offers a choice of data-specific scripts.

Note that the scripts listed by default are those resident in the default installation directory (tektronix\scripts). Other directory locations can be specified in Expert Mode. All selections will be retained between sessions.

Syntax Checking

Scripts are syntactically analyzed when the OK button is selected. They are also checked when the application is opened. A fault in the syntax of a script will not necessarily prevent a stream from being analyzed, but it may result in incomplete analysis of the stream.

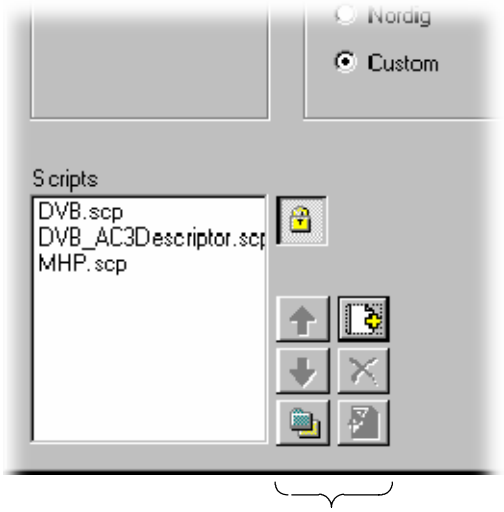
Scripts listed in the Scripts text box will not be used for stream analysis until they have been successfully checked; (the application has been opened or the Stream Interpretation dialog box has been closed with no script-related error messages issued).

An intermediate check of scripts listed in the Scripts text box can be made by selecting the Reload Scripts button. This performs the same action as the OK button but leaves the dialog box open.

Syntactic errors will be indicated and reported in the Event Log (see page 8–57).

Export Mode

Expert Mode allows you to select and customize the scripts to be used in stream analysis and multiplexing. Note that when the expert mode is selected, the Custom extension option is automatically selected and that the management buttons are enabled. In Expert mode, all scripts become available to be added to the script list. The scripts will be checked and loaded, ready to be used for analysis, when the OK button is selected.



The script management buttons act on the scripts currently listed in the Scripts text-box.

	Script files are parsed in the order that they are listed; in some circumstances this may be important. To move a file in a list, highlight the file name and select the Up or Down arrow button as required. Each press of the button will move the file up or down one place in the list until it reaches the top or the bottom.
	Add a script to the list: A standard Windows file selection dialog box is opened. The default file extension is .scp. Select the required file. The selected script will be added to the bottom of the list. If necessary, it can be moved using the Up and Down buttons. Scripts can be loaded from any directory.
	Delete the highlighted script.

	Change scripts default directory: by default, all scripts are found in a default directory created during installation (tektronix\scripts). This button can be used to set a different default directory. Note that all scripts supplied by Tektronix in the default installation are installed in a single directory; as long as this directory is designated as the default directory, they will work satisfactorily.
	View highlighted script with the associated application; by default, script files are associated with the ScriptPad utility.

For a script file to be viewed successfully, the file extension (.scp) must be associated with a text editor in the MS Windows environment. The MPEG Test System installation program associates by default a script editing utility called ScriptPad; you can use another text editor, for example, MS Notepad, if preferred. ScriptPad is a simple script editor that can be installed with the MPEG Test System. Scripts can be viewed and edited as required (depending upon the file permissions).

Opening a Stream

Two options are available when opening a stream for multiplexing: to open an existing stream or to open a previously prepared multiplex configuration file.

Three options are available when preparing a stream to be multiplexed:

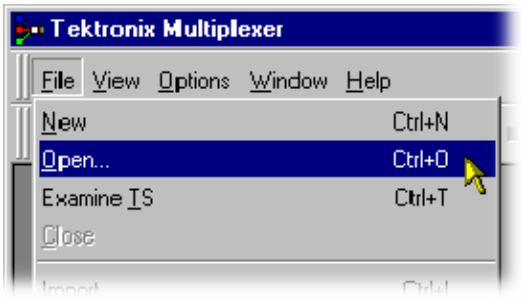
- Create a new null stream (using File > New)
- Open an existing stream
- Import a multiplexer configuration file

Opening an MPEG Stream

Any file holding a recorded or synthesized sample of a stream that is conformant to the relevant standards can be opened and used as a basis for a new multiplex. (Note that the Examine TS option (see page 8–58) can be used to preview stream.)

Some non-conformant streams can be opened, although, only the conformant parts can be edited usefully. Any tables that are carried in a conformant PID and have the correct syntax will appear in the output transport stream, as will any elementary streams (whether referenced by a table or not) which are in the input transport stream.

To open a file holding a transport stream, select the Open... option from the File menu. If the required file is in the list of recent files, it can be opened from the list to save using the open file dialog box.



Alternatively use the Ctrl+O keyboard shortcut or drag the file from Windows Explorer and drop it into the Multiplexer window. There is also a shortcut button available on the Toolbar for opening a file:

Multiplex Configuration Files

Any file holding a recorded or synthesized sample of a stream, which is conformant to the relevant standards, can be opened. Many non-conformant streams can be opened provided that the PAT, PMT and MGT tables correctly specify all the other tables and their PIDs.

Multiplexer is used for generating both conformant and non-conformant streams. Having generated a non-conformant stream, it may not be possible to successfully open it again in Multiplexer.

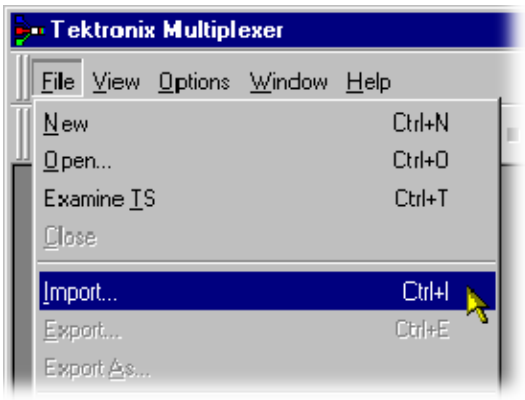
The specification for a new transport stream may be saved to a multiplex configuration file. This also saves time for opening large MPEG files, since the specification contains the results of the analysis from opening the original MPEG file.

***NOTE**. The multiplex configuration file does not contain a copy of the transport stream, instead, it refers to the original MPEG file by the full path name. Deleting or moving the MPEG file will result in a dialog box prompting for the new location of the file.*

Double-clicking on a *.muxml or *.mux file in Windows Explorer will open the file in a new instance of Multiplexer.

Importing a File. Importing opens a multiplex configuration file and the MPEG file on which it is based.

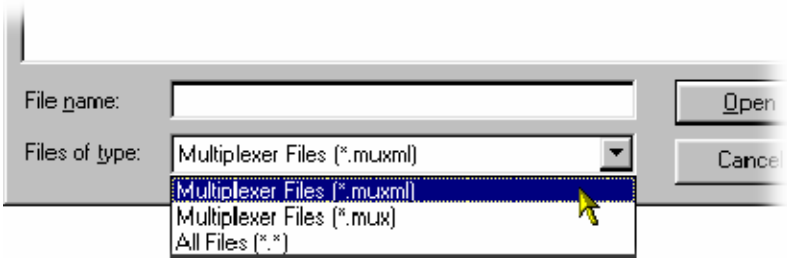
To open a previously exported multiplex configuration file, select the Import... option from the File menu. If the required file is in the list of recent files, it can be opened from the list to save using the Import file dialog box.



Alternatively use the Ctrl+I keyboard shortcut or drag the file from Windows Explorer and drop it into the Multiplexer window.

NOTE. *Multiplexer reads the name and location of the MPEG file from the multiplex configuration file and then opens it automatically. The previously stored changes in the configuration file are applied to the display.*

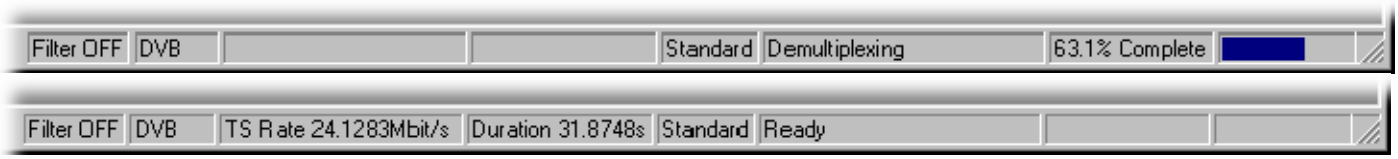
Note that the import dialog box offers a choice of file types: *.muxml, *.mux and *.*.



Initial Stream Analysis

The Navigator Tables view window is opened as soon as a file is opened or imported. The program now starts to analyze the file with the loaded scripts to determine what tables are present.

As the file is analyzed, the Top Levels of the Transport Structure diagram are drawn in the Navigator window. The rightmost pane in the Status Bar at the bottom of the program window shows the progress of analysis**.**



Files that are imported require less processing since they were analyzed in the session from which they were exported.

What to Do Next

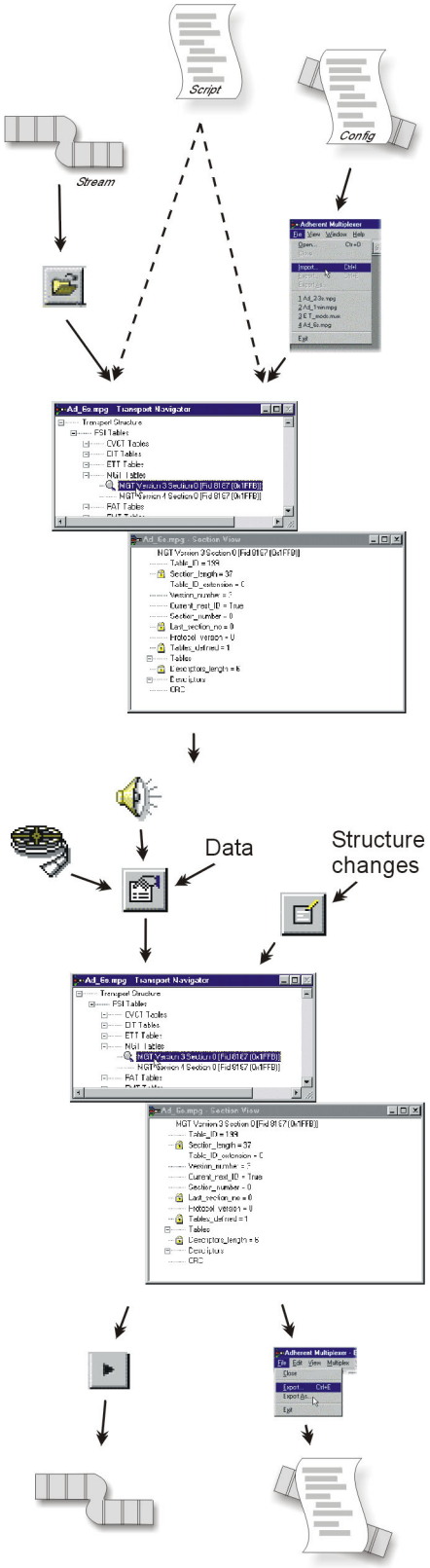
The file can now be manipulated to form a specification with which to synthesize a new transport stream. Tables, elementary streams and PIDs are viewed and selected via the Navigator views. The components of any table selected in the Navigator views are viewed and selected via the Section View window.

Tables, Programs and PIDs can be added and modified using the wizards provided or manually. A selection of menu options are provided to facilitate manipulation of the data.

The Multiplex menu has options for inhibiting and reenabling enforcement of conformance to the selected standards.

Having manipulated the file, a transport stream can be synthesized to the new specification by the multiplex engine. The engine is started from the Multiplex menu or via a toolbar button. The source file is used as reference data by Multiplexer and the output written to a different file.

The illustration overleaf gives an overview of the Multiplex process.



Open/Import

Any file holding a recorded or synthesized sample of a stream that is conformant to the relevant standards can be opened. See *Opening an MPEG file*.

Importing opens a multiplex configuration file and the MPEG file on which it is based.

See *Importing a file*, page 8-11.

Transport Structure Demultiplex

As the file is analyzed, the Top Levels of the Transport Structure diagram are drawn in the Transport Navigator.

See *Initial Stream Analysis*, page NO TAG.

Transport Structure Modifications

The file can now be manipulated to act as the specification to synthesize a new transport stream. The tables and elementary streams are viewed and selected either with the aid of Wizards or in the Navigator windows.

Output/Export

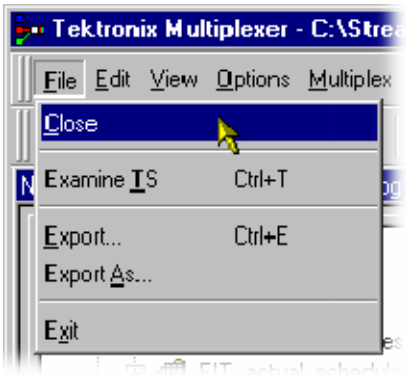
The Multiplex Engine synthesizes a new transport stream and writes it to an MPEG file.

To ensure that the specification for any synthesized stream can be reused, it can be saved to a multiplex configuration file.

See *Multiplexing Transport Streams*, page 8-111.

Closing Files

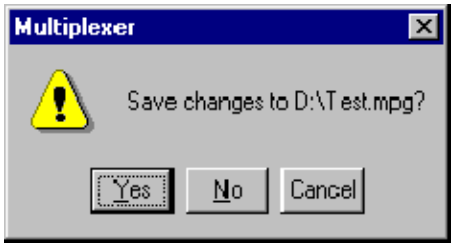
To close the files, select the Close option from the File menu. This will close both the MPEG file and any multiplex configuration file that is open.



There is also a shortcut button available on the Toolbar for closing a file, which has a standard file close symbol:

If a multiplex configuration file has been edited, and the changes not exported, the program will ask if the file should be saved.

Select Yes to export the file, No to close the file without saving, or Cancel to undo the close command and keep the file open.



Menus and Controls

The following pages contain descriptions of the different menu options, toolbar controls, status bar, icons, and user interface.

Menu Options

The following pages describe all of the menu options. Since many of the options are context sensitive, they will be available only when their function is appropriate for the selected display or window element. When a menu option is not available, the option is grayed out.

File menu options

Table 8–3 list the options available in the File menu.

Table 8-3: File menu options

Command	Function
Close	Closes the current file. This option is available as soon as analysis starts. If the wrong file is being opened, or the wrong options are selected, selecting this option will abandon the analysis and close the file.
Examine TS	Opens the Examine TS window, which allows a brief summary of the stream to be viewed before it is subjected to full analysis.
Export...	Exports the current multiplex specification in a form that can be imported even if it no longer generates a conformant transport stream. This option is disabled when no file is open.
Export As...	Exports the current file, as above, and allows a different file name to be specified. This options is disabled when no file is open.
Exit	Closes any file that is open and terminates the program.

Edit menu options

Table 8–4 list the options available in the Edit menu.

Table 8-4: Edit menu options

Command	Function
Add	Adds a table/section/loop to the currently selected item in the Navigator or Section View.
Modify	Edits the information in the currently selected field or item.
Delete	Deletes the item currently selected.
Cut	Cuts the current selection from the window to the clipboard.
Copy	Copies the contents of the current selection to the clipboard.
Paste	Pastes data from the clipboard to the part of the transport structure that holds that type of data.
Export Payload	Extracts and exports the payload of the source transport stream PID in the form of a simple data file.
Export Elementary Stream	Removes the transport stream PID and PES headers and exports the remaining information in the form of a simple data file.
Export Section Data	Extracts and exports section data. The created file can be imported as ES using Multiplexer's Add function or as SI using the Import Section Data option (see next option).
Import Section Data	Imports SI data from a file and analyzes it. The section is added to the Navigator view.

View menu options

Table 8–5 list the options available in the View menu.

Table 8-5: View menu options

Command	Function
Interpretation	Displays a read-only dialog box for viewing scripts that have been selected for analysis (see also Initial Menu Options, page NO TAG).
Section View	Opens the window and displays the table section currently selected in the Navigator view.
Event Log	Displays the list of events that are recorded in the Event Log.
Component Bitrate	Displays a graphical comparison of the stream bit rates.
Component Duration	Displays a graphical comparison of the stream component durations.
Available Bitrate	Display a graphical view of the bit rate in the stream.
Properties	Opens a properties dialog box for editing the currently selected item in the Transport Navigator window.

Table 8-5: View menu options (Cont.)

Command	Function
Zoom In	Zoom in to the Available Bitrate and Component Duration views.
Zoom Out	Zoom out from the Available Bitrate and Component Duration views.
Synchronize	Synchronizes zoom level of the Available Bitrate and Component Duration views (toggle action).
Show Cursor	Shows or hides the cursor in the Available Bitrate and Component Duration views.
Toolbar	Shows or hides the Toolbar.
Status Bar	Shows or hides the Status Bar.

Options menu options

Table 8–6 list the options available in the Options menu.

Table 8-6: Options menu options

Command	Function
Display Filter	Opens the SI Filter dialog box.
Single Section View	Selects single or multiple section view. When disabled, multiple section views can be opened.
Program Wizard	Invokes the Program wizard.
Transport Wizard	Invokes the Transport wizard.

Multiplex menu options

Table 8–7 list the options available in the Multiplex menu.

Table 8-7: Multiplex menu options

Command	Function
Start	Starts the Multiplex Engine, to synthesize a new transport stream file.
Stop	Aborts multiplexing. The output file is closed and contains all of the data synthesized up to the point where the multiplex engine stopped. This option is available only while the Multiplex Engine is running.
Standard Mode	Enforces conformance to the selected standards when editing some fields that can be generated automatically.
Expert Mode	Inhibits the above conformance checking so that non-conformant files may be created.
Report	Provides the option of printing all or part of the transport structure to either a file or a printer.
Seamless	When enabled, the program specified in Seamless Settings is processed and made seamless.
Seamless Settings	Opens a dialog box in which the Make seamless parameters are specified.

Window menu options

Table 8–8 list the options available in the Window menu.

Table 8-8: Window menu options

Cascade	Cascades the open windows when Options > Single Section View is disabled.
Tile	Tiles the windows horizontally when Options > Single Section View is disabled.
Arrange Icons	Aligns icons of any minimized windows at the bottom of the program's main window.
1 <window title> 2 <window title> 3 ... etc.	Makes the named window active, putting it on top of any windows that had been hiding all or part of it.

Help menu options

Table 8-9 list the options available in the Help menu.

Table 8-9: Help menu options

Command	Function
About Multiplexer	Opens a dialog box that displays the program version number and license number.

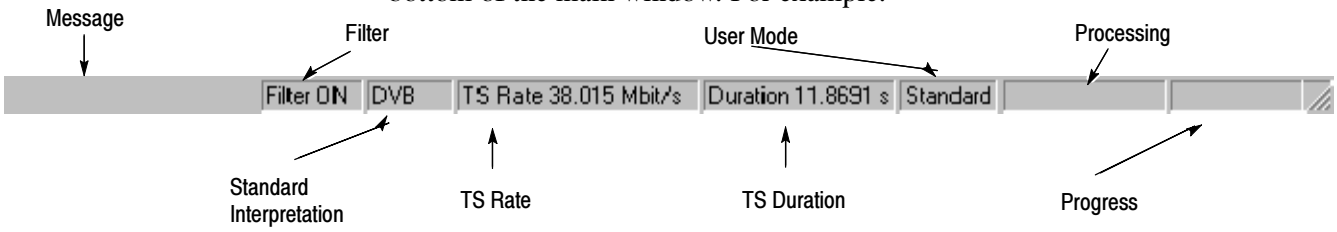
Toolbar

Toolbars provide a set of convenient shortcuts for the more frequently used menu options. The buttons are context sensitive and are enabled or disabled dependent upon the currently highlighted view or the action being performed.

The Toolbar may be hidden from view - View > Toolbar.

Status Bar

The Status Bar may be hidden from view, but when displayed it is always at the bottom of the main window. For example:

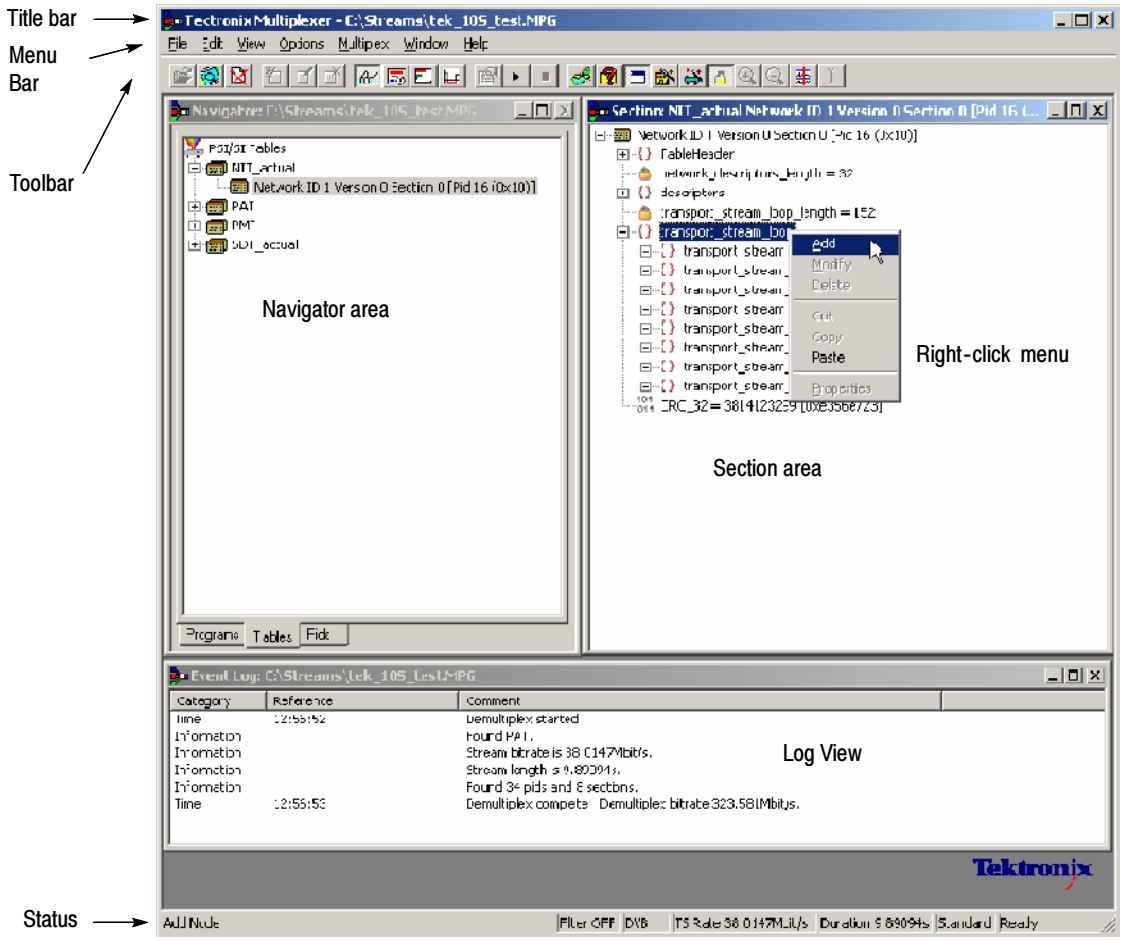


From left to right, the following information is displayed on the Status Bar:

Message Field	Provides a description of any button or menu option over which the cursor pointer is placed. Other non-critical messages may also be shown.
Filter Status	Indicates the status (On /Off) of the SI Filter.
Standard Interpretation	Indicates the standard selected with which to process the file; MPEG–2, ATSC or DVB.
TS Rate & Duration	Shows the transport stream rate and the duration at that rate. A default rate is displayed during initial analysis.
User Mode	Shows User mode selected; Expert or Standard. Standard mode prevents changes to certain fields. Expert mode enables editing.
Processing Status	Indicates the progress (%) during initial analysis and multiplexing.
Processing Progress	Indicates the progress during initial analysis and multiplexing.

The Status bar may be hidden from view – View > Status Bar.

User Interface



NOTE. *The Menu Bar contains the complete selection of options available in the Multiplexer. Shortcuts to options are available through the toolbar and context-sensitive right-click menus.*

Icons

Icons are used throughout the Multiplexer user interface to assist you to identify components and make visual links with toolbar shortcuts and menu options.

The following table lists all the icons used.

Table 8-10: Icons

Icon	Description	Icon	Description
	About Multiplexer		Program
	Add		Program Group
	Audio stream		Program Wizard
	Bit field		Properties
	Close		Report
	Container/Loop		Seamless
	Copy		Seamless Settings
	Current selection		Section
	Cut		Section timing
	Delete		Section View
	Display Filter dialog box		Single window
	Examine Transport Stream		Standard mode
	Exit		Start
	Expert mode		Stop
	Export		Table

Table 8-10: Icons (Cont.)

Icon	Description	Icon	Description
	Export As		Transport Stream icon
	Export Elementary Stream		Transport Wizard
	Export Payload		Unknown
	Export Section Data		Video stream
	Import Section Data		View Event Log
	Modify		View Component Duration
	New		View Component Bitrate
	Open		View Available Bit Rate
	Paste		

Cutting and Pasting

Table types, sections, and PIDs can be cut, copied, and pasted using the windows clipboard. Only one selection can be held on the clipboard at a time. Alternatively, a selection can be dragged and dropped using the mouse.

Cutting a Selection to the Clipboard.

A selection (table type, section or PID) can be deleted and automatically placed on the windows clipboard. It can then be pasted to a different file or back into the current file. Highlight the selection in the Navigator Tables or PIDs view and select the Cut option from the Edit menus, or use the Ctrl+X keyboard shortcut.

Copying a Selection to the Clipboard.

A selection (table type, section or PID) can be copied to the windows clipboard. From the clipboard, it can be pasted to a different file or back into the current file.

Highlight the required selection in the Navigator Tables or PIDs view and then select the Copy option from the Edit menu, or use the Ctrl+C keyboard shortcut.

Pasting a selection from the clipboard.

More than one instance of Multiplexer can run concurrently on a machine. A selection (table type, section, or PID) may be pasted from the clipboard into any open transport stream file. The contents of the clipboard are not affected by the paste operation, so the section can be pasted to many files and more than once to the same file.

Activate the Navigator Tables or PIDs view of the required transport stream file (that is, in an instance of Multiplexer). Then select the Paste option from the Edit menu, or use the Ctrl+V keyboard shortcut.

The section/version is always appended to the end of the list under the appropriate table. Program/version numbers are automatically created. If the table is not present in the multiplex configuration, it will be created automatically.

Dragging and Dropping

A concept familiar to windows users is “drag and drop” in which files can be highlighted by clicking on them with the mouse and then dragged and dropped to a new location, either in the same application or across applications.

In Multiplexer probably the main use of the drag and drop feature will be when building new multiplexes or modifying existing ones.

Elements can be dragged within Multiplexer, or from the Multiplexer Browser, Windows Explorer or other instances of Multiplexer.

Program references and numbering will be automatically added and/or updated when a new program is dropped onto the navigator Programs view.

***NOTE**. Only the MPEG aspects of the transport structure are updated. Tables specific to DVB and ATSC are not updated.*

Manipulation in Program view.

- When using Navigator Program view, a program can be copied or dragged. The program can be dropped only on the transport stream node of the Program view.
- Only the standard MPEG elements are copied, namely the PAT entry, the PMT section and the elementary streams. Standard dependent information is not copied, for example, DVB SDT.
- Where a conflict occurs with the target, new values will be allocated. that is, Program Number and PID numbers.
- Elementary streams can also be dragged and dropped between Program Views. They can only be dropped onto the elementary stream root node.
- An elementary stream may have a stream type, a component tag and descriptors associated with it; this information is retained during a drag and drop in the program view. The program view displays this information when the properties dialog box is activated.

Wizards

In the Navigator Programs view, wizards provide you with a step-by-step approach to building streams to be multiplexed by offering defaults for PSI/SI and the opportunity to include user-selected programs. The standard previously selected in the Interpretation dialog box will dictate the PSI/SI components offered.

There are two major wizards: the Transport Wizard and the Program Wizard. Other minor wizards may be opened by these major wizards or they may be invoked in their own right to facilitate specific tasks, such as adding EIT information. When configuring a new multiplex, the Transport Wizard is opened, followed by the Program Wizard; although, on completion of the Transport phase, an opportunity to exit the wizard process is offered before the Program Wizard opens. For some detailed operations, only the appropriate wizard may be opened.

At their most basic level, wizards invoke, in a logical order, the property dialog box that are available when building a stream manually.

The following paragraphs provide a step-by-step description of the wizards.

Wizard Controls

The following control buttons are provided on the wizard dialog boxes where relevant:

Next	Retain changes made using this dialog box and move to next dialog box.
Back	Discard changes made using this dialog and return to the previous dialog box.
Cancel	Exit the wizard and discard all changes.
Finish	Exit the wizard and implement all changes.

Transport Wizard

Toolbar icon:

The Transport wizard allows you to easily create a basic stream populated with the PSI/SI necessary to hold program information. It may also be invoked when PSI/SI is to be added to an existing stream.

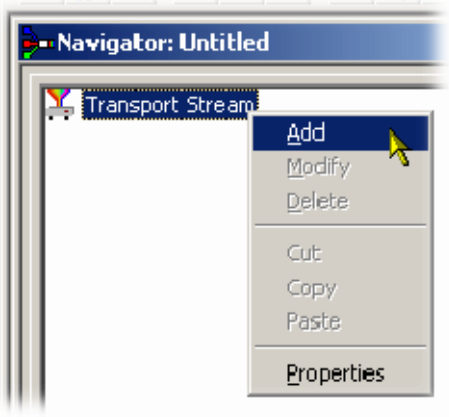
Creating a New Transport Stream

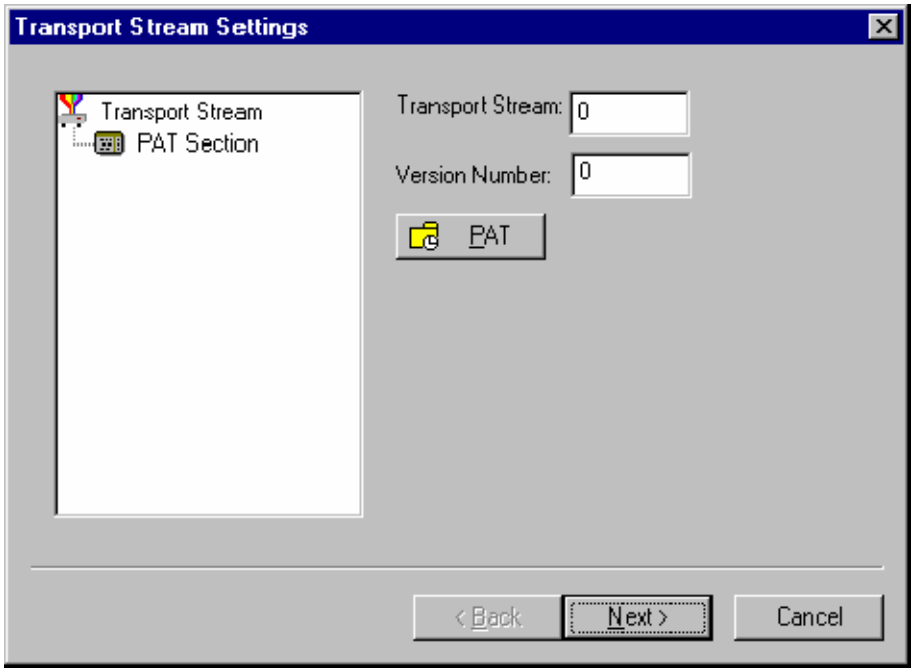
***NOTE**. If, when the Transport Wizard is used to populate a new stream, the defaults in the various dialogs are retained and the resulting stream will conform to the standard selected.*

The following steps show the screens used in the creation of a DVB stream.

1. Open a new file; File > New.
2. Select the Program tab in the Navigator view.

3. Select and highlight the Transport Structure element; at this stage in the creation of a new stream, this will be the only element visible in the Program Navigator view.
4. Select Add from the right-click menu.



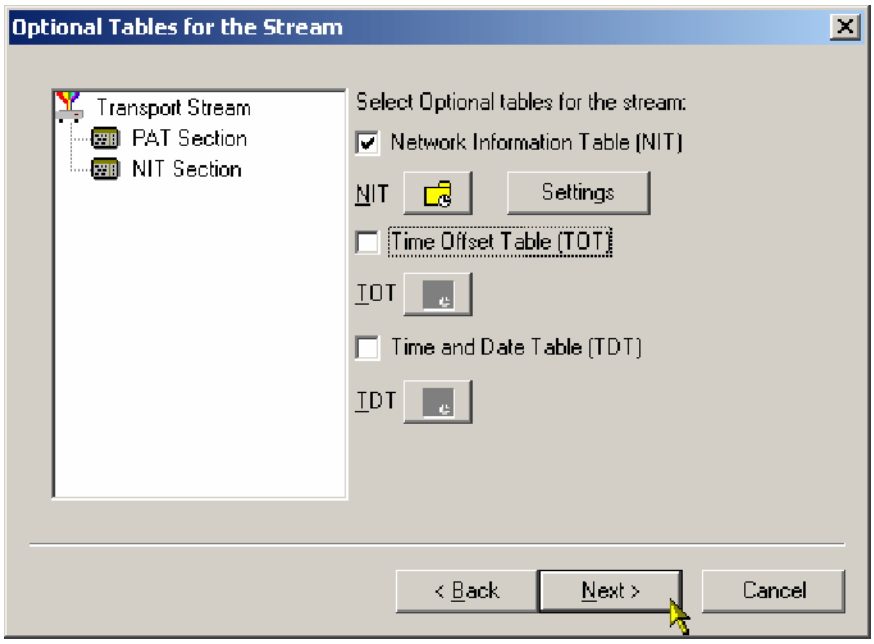


The Transport Stream Settings dialog box allows you to set up the transport stream identity (part of the PAT section) and version. Adjustments can also be made to the PAT timing, if required, by selecting the PAT button.

PAT timing - see *Editing PSI/SI Table Properties*, page 8–85.

5. Select Next to move to the Optional Tables dialog.

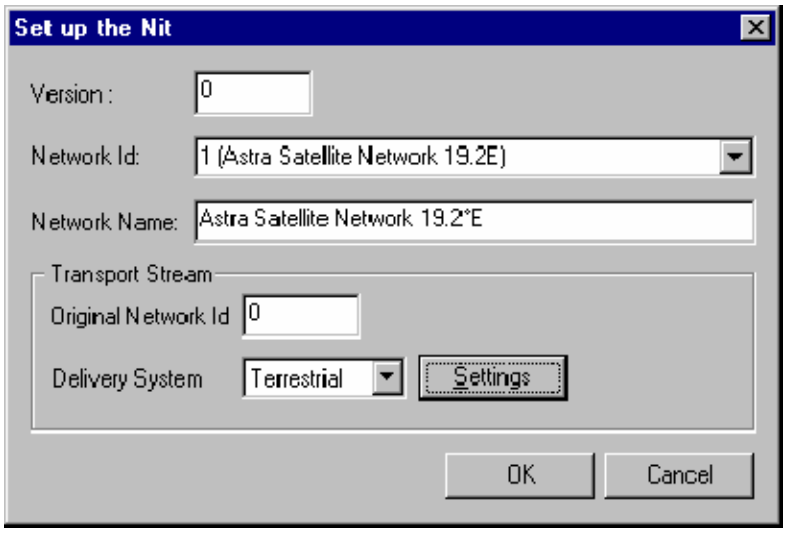
6. This dialog box allows you to include, and if required, configure basic PSI/SI information.



As the checkbox next to each table is enabled, the table name is added to the graphical representation on the left. The associated buttons are also enabled to allow timing or other aspects of the table to be modified.

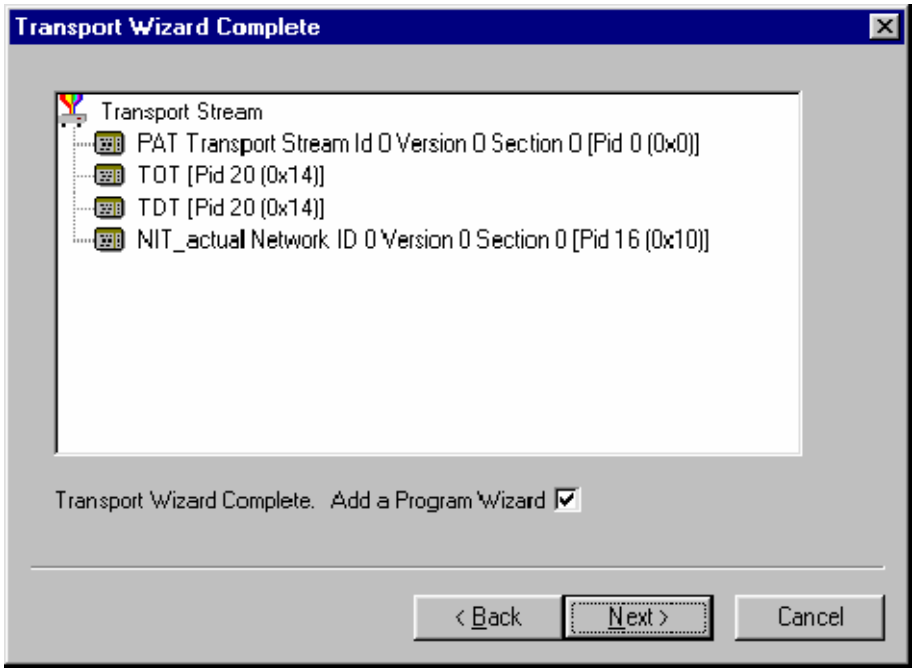
NIT, TOT, and TDT Timing - see *Editing PSI/SI Table Properties*, page 8–85

NIT Settings



To set up the Network Information Table (NIT), enter or select the values required and select the OK button. Note that if a Delivery System other than Undefined is selected, an additional settings dialog box becomes available, specific to the Delivery System chosen.

7. Select Next to move to the Transport Wizard Complete dialog box.


Transport Wizard Complete
Transport Stream
PAT Transport Stream Id 0 Version 0 Section 0 [Pid 0 (0x0)]
TOT [Pid 20 (0x14)]
TDT [Pid 20 (0x14)]
NIT_actual Network ID 0 Version 0 Section 0 [Pid 16 (0x10)]
Transport Wizard Complete. Add a Program Wizard
< Back
Next >
Cancel

This dialog box allows you to review the changes made by the wizard before confirming the process.

The wizard process can be cancelled, thereby losing all changes, by selecting the Cancel button.

At this stage in the creation of a new multiplex, if you want to add programs, leave the Add Program Wizard checkbox enabled and select Next. If you do wish to add programs at this stage or want to add them by some other means, clear the Add a Program Wizard checkbox. The Next button label will change to Finish, which allows you to exit the wizard and implement all changes.

When the Transport Wizard has closed, note that the Navigator views are updated with the new PSI/SI.

Program Wizard

Toolbar icon:

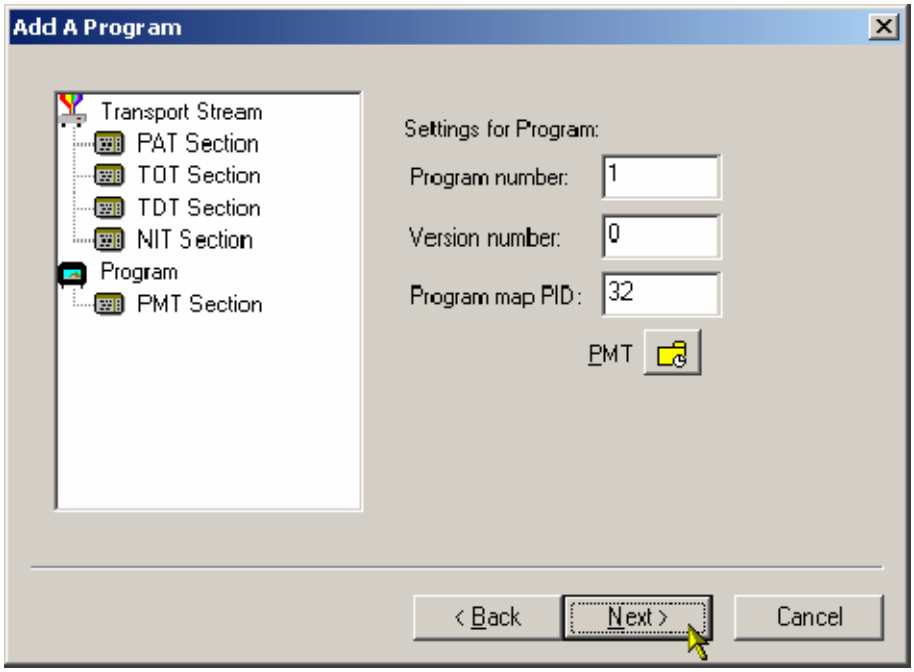
The Program Wizard allows you to add programs as required to a stream that is already populated with basic PSI/SI. Each use of the Program Wizard allows the addition of one program. Adding more programs requires the wizard to be opened each time.

If a new stream is being created, the Transport Wizard offers an opportunity to open the Program Wizard. Alternatively, in the Navigator Programs view, highlight the Programs node and select Add from the right-click menu.

Adding a Program to a Tranport Stream

***NOTE**. If, when the Program Wizard is used to add programs to a stream, the defaults in the various dialogs are retained, the resulting stream will conform to the DVB standard.*

1. When you open the Program Wizard, either as a continuation of creating a new stream or by attempting to add a new program, a dialog box similar to that shown below is displayed:



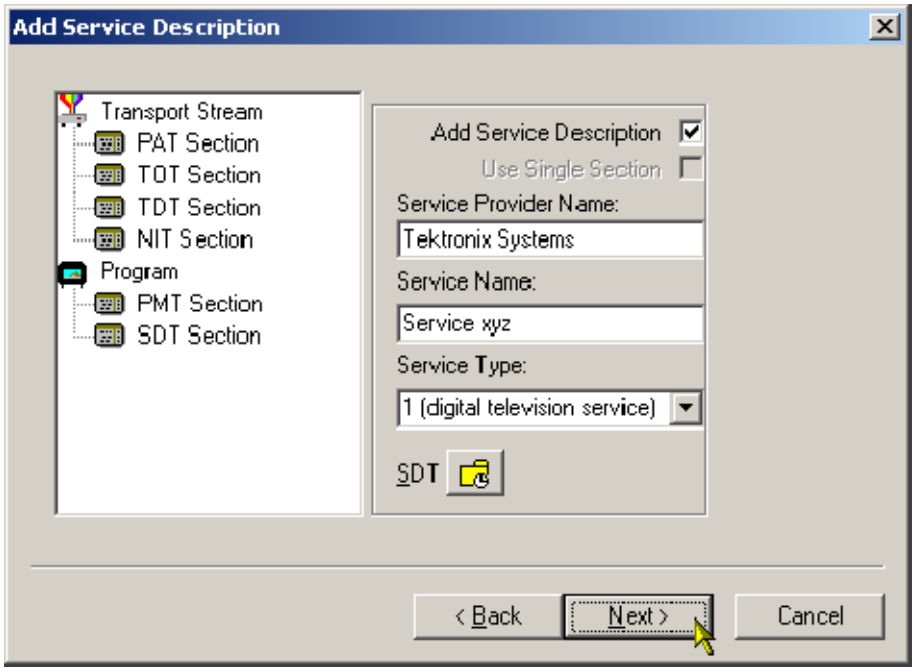
The values placed automatically in the three displayed fields will be the next in the sequence of programs. (In the example screenshot, the stream contains no prior programs, hence this is program number 1. PID 32 is used because that is the first free PID after the reserved PSI/SI PIDs.)

PMT Timing - see *Editing PSI/SI Table Properties*, page 8–85.

2. Select Next to move to the Add Service Description dialog box.

Service Description Dialog Box

The Service Description dialog box allows you to identify the Service and Provider to be associated with a program.



3. By default, the Add Service Description checkbox is clear. When it is enabled, a Service Provider Name and a Service Name must be entered and a Service Type selected from the drop-down list. If no details are provided, the section will still be created but the relevant descriptors will be empty.

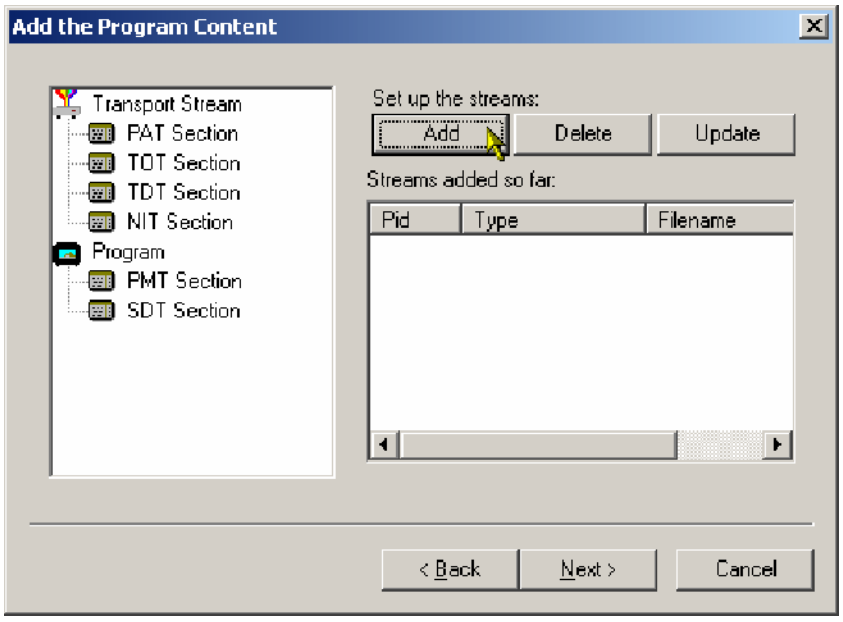
   Enabling the Use Single Section checkbox will cause the SDT descriptors to be added to the existing SDT section. If the stream contains no SDT section, the checkbox is disabled.

   SDT timing - see *Editing PSI/SI Table Properties,* page 8–85.

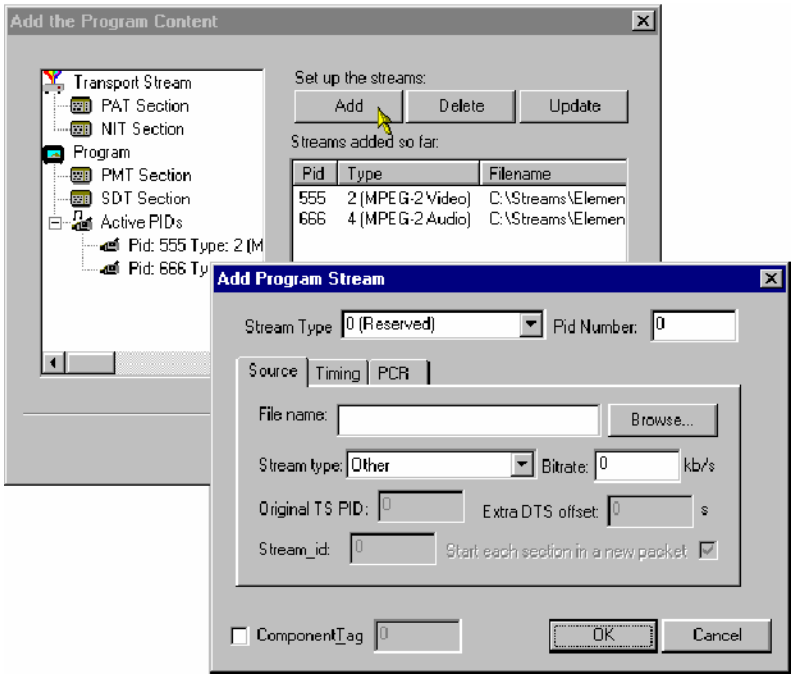
4. Select Next to move to the Program Content dialog.

Program Content Dialog Box

This dialog box allows you to compile a list of elementary streams to be associated with the program in the final multiplex.



5. Select Add to display the Add Program Stream dialog box.



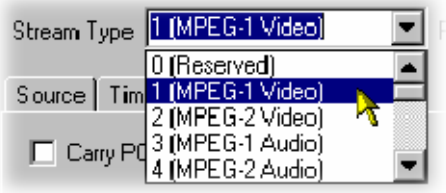
This dialog allows you to identify elementary streams to be included in the new multiplex. You must specify the PID, Stream Type of the new stream; a Component Tag can also be allocated.

If the Component Tag is enabled, it can be referenced by other tables; for example, the Event Information Table.

The dialog box comprises three tabbed pages that specify the source of the stream, its timing within the multiplex, and whether it should be carrying a PCR PID.

6. Allocate a PID Number in which the elementary stream is to be carried.

Select a Stream Type from the drop-down list.



This will be the Stream Type allocated to the stream in the new multiplex.

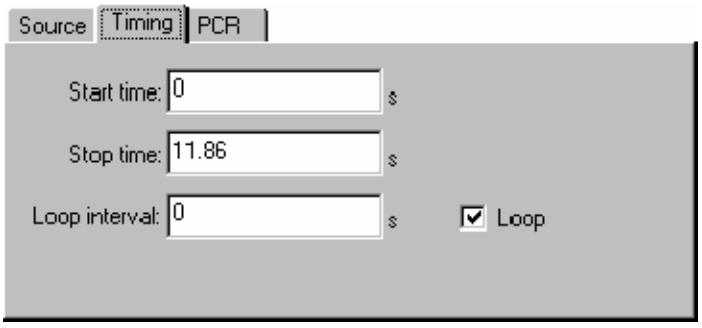
7. Enable the Component Tag checkbox, if required. Enter a Component Tag number (0 - 255) in the enabled field.

Source Tab. The Source tab of the Add Program dialog box is used to select and specify elementary streams to be included in the new multiplex.

8. Enter an elementary stream File Name. You can enter it directly or use the Browse button to open a standard Windows file selection dialog box.
9. Select the Stream Type of the selected stream from the drop-down list.

   The remaining fields on this tab will be enabled or disabled depending on the Stream Type selected. Complete the enabled fields as necessary.

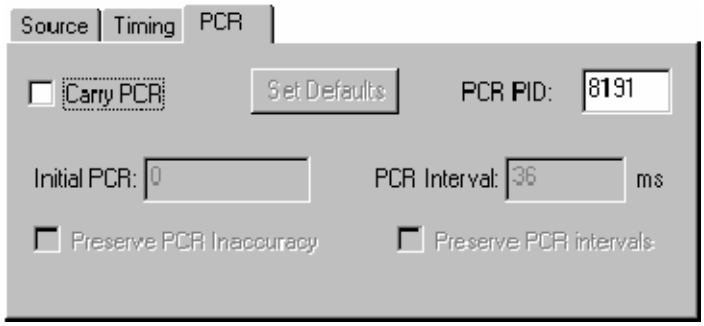
Timing Tab. The Timing tab of the Add Program dialog box is used to specify for what portion of the new multiplex the selected stream will be used.



10. Complete the fields as required. The default settings assume that the stream is to be carried throughout the new multiplex, looping if necessary.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

PCR Tab. The PCR tab of the Add Program dialog box is used to specify whether PCR information should be carried with the selected elementary stream or in a separate associated PID.



11. If the PCR is to be held in an associated PID, disable the Carry PCR checkbox and enter a PCR PID number.

12. If the PCR is to be carried with the stream, enable the Carry PCR checkbox and complete the remaining fields as required.

13. Select the OK button to complete the addition of an elementary stream to the listing in the Program Wizard.

Set Defaults returns the settings to their initial values.

More streams can be added using the Add button. Listed streams can be deleted using the Delete button. Details of listed streams can be modified using the Update button.

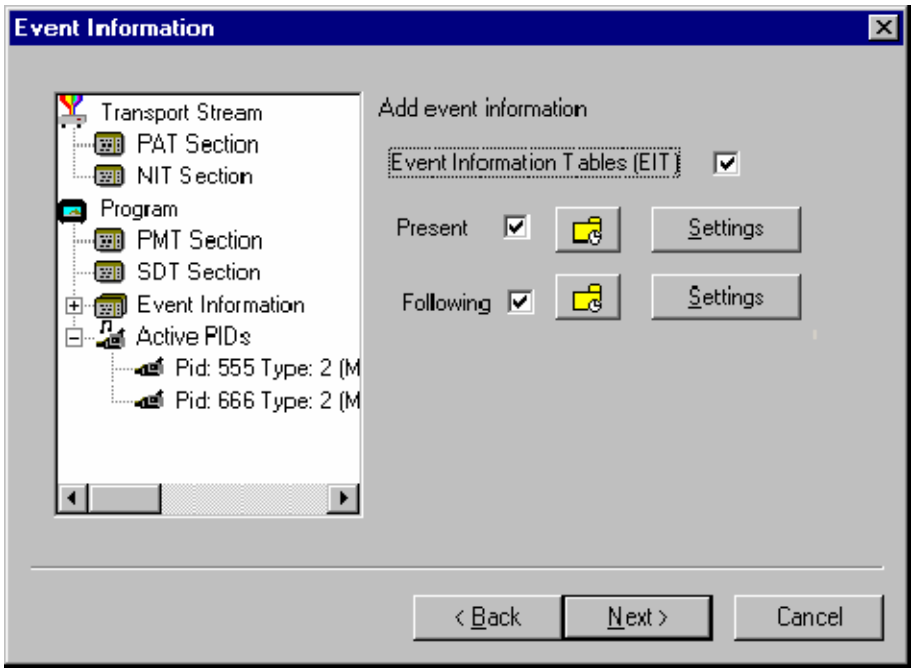
That completes the addition of one or more program streams.

14. Select Next to move to the Event Information dialog box.

For more details of the fields on these tabs - refer to *Adding an Unreferenced Elementary Stream*, page 8–92.

Event Information Dialog Box

The Event Information dialog box allows you to add Present and Following event information.



15. If the Event Information Table (EIT) is to be included in the multiplex, enable the Event Information Table checkbox.

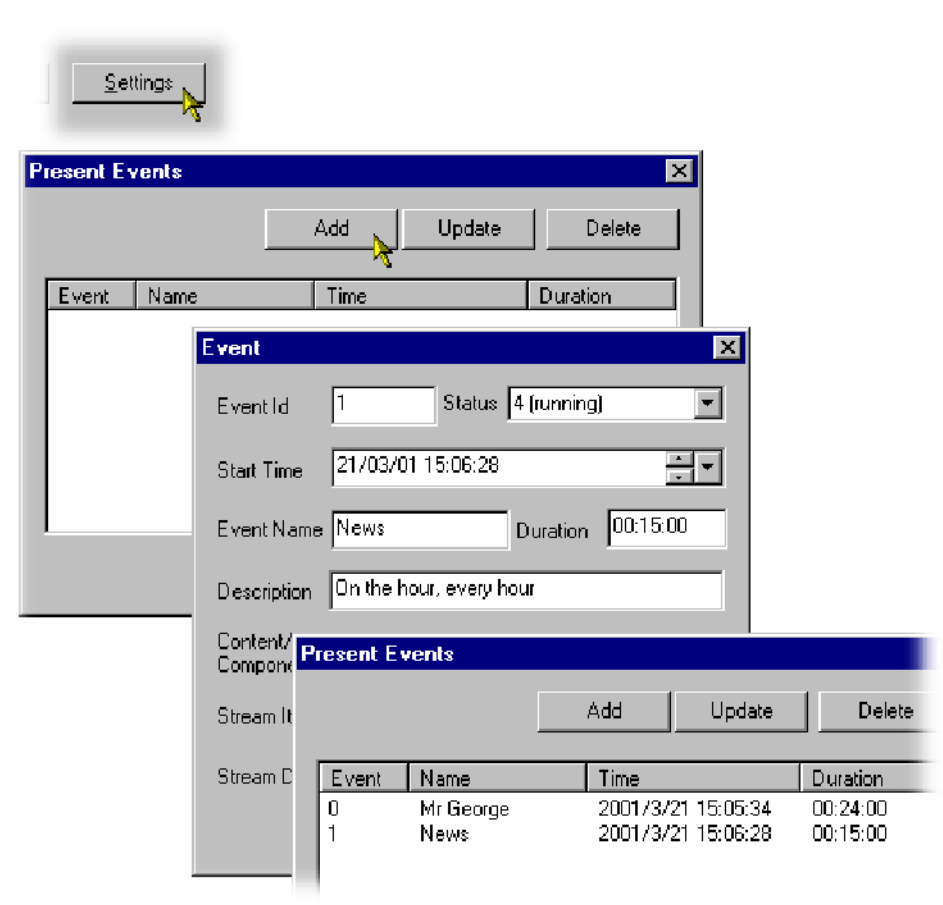
16. Enable the Present and following checkboxes as required.

Present/Following timing -

see *Editing PSI/SI Table Properties*, page 8–85.

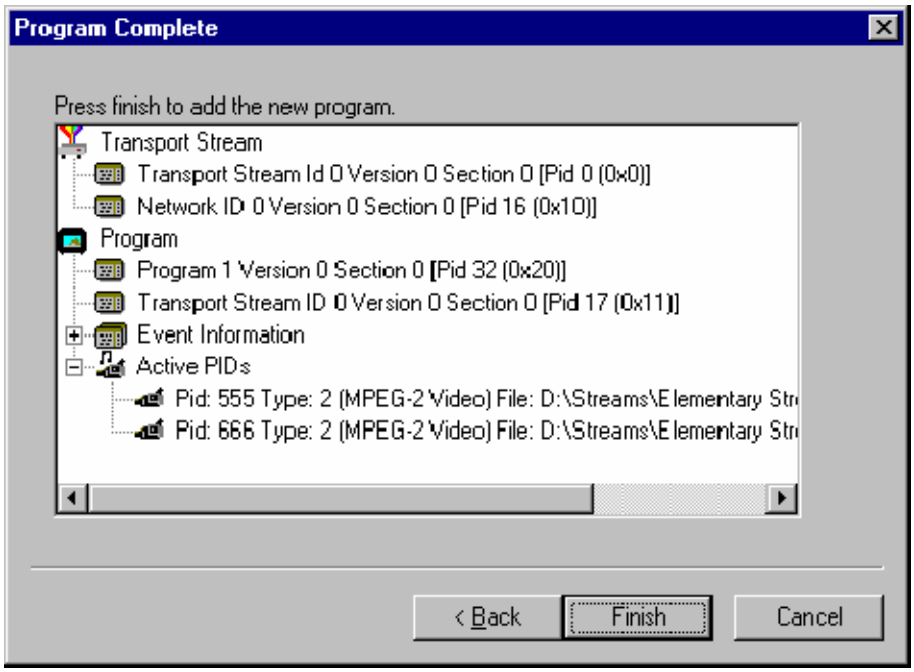
17. Use the Settings buttons to open the Present/Following Events dialog box and add and specify events as required.

18. Select Next to move to the Program Complete dialog box.



Program Complete Dialog Box

The Program Complete dialog box provides you with a summary of the created Transport Structure.


Program Complete
Press finish to add the new program.
Transport Stream
Transport Stream Id 0 Version 0 Section 0 [Pid 0 (0x0)]
Network ID 0 Version 0 Section 0 [Pid 16 (0x10)]
Program
Program 1 Version 0 Section 0 [Pid 32 (0x20)]
Transport Stream ID 0 Version 0 Section 0 [Pid 17 (0x11)]
Event Information
Active PIDs
Pid: 555 Type: 2 (MPEG-2 Video) File: D:\Streams\Elementary Str
Pid: 666 Type: 2 (MPEG-2 Video) File: D:\Streams\Elementary Str
< Back
Finish
Cancel

19. To confirm and implement the Transport Structure, select the Finish button.

Note that the proposed structure is created in the Navigator views.

That completes the procedure of adding a program to a transport stream using the Program Wizard.

Views

Multiplexer contains a number of views which are displayed in the working area of the user interface. All of the views can be manipulated using conventional Windows techniques. The Navigator and Error Log views can be docked against the edges of the UI or floated independently of the Multiplexer window. The Section view can be manipulated within the Multiplexer window, including tiling and cascading where multiple Section views are displayed.

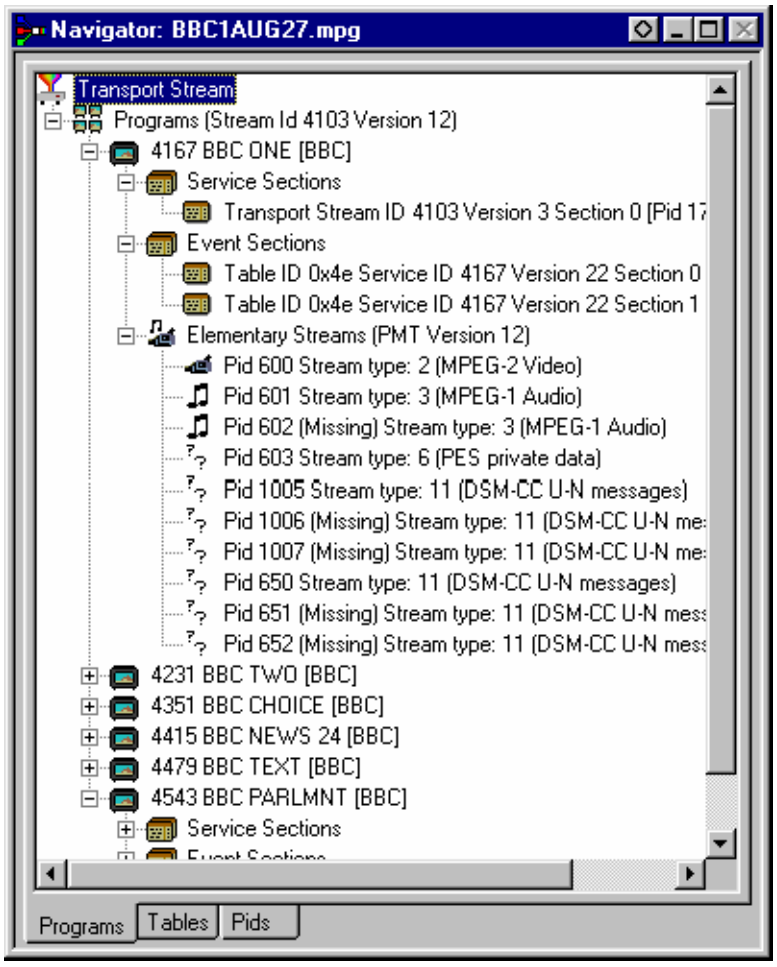
Each view available displays a different aspect or level of detail of stream analysis and manipulation.

Navigator Views

The Navigator view contains three subviews or tabs: Programs, Tables, and PIDs.

Program Views

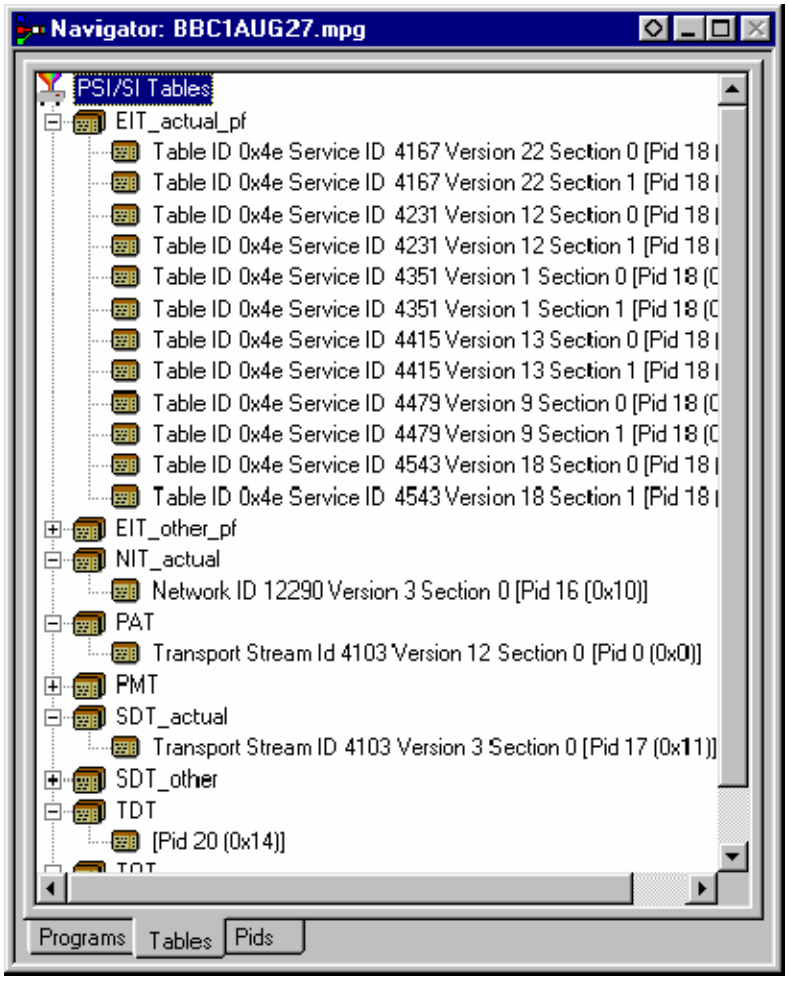
The Navigator Programs view extracts and displays system information that is relevant to programs. Information that is not directly related to programs (for example, NIT), or that has not been incorporated into a program (for example, elementary streams not listed in a PMT) will be omitted from the Program view; the information is still available for viewing in the Navigator Tables and PIDs views.


Navigator: BBC1AUG27.mpg
Transport Stream
Programs (Stream Id 4103 Version 12)
4167 BBC ONE [BBC]
Service Sections
Transport Stream ID 4103 Version 3 Section 0 [Pid 17
Event Sections
Table ID 0x4e Service ID 4167 Version 22 Section 0
Table ID 0x4e Service ID 4167 Version 22 Section 1
Elementary Streams (PMT Version 12)
Pid 600 Stream type: 2 (MPEG-2 Video)
Pid 601 Stream type: 3 (MPEG-1 Audio)
Pid 602 (Missing) Stream type: 3 (MPEG-1 Audio)
Pid 603 Stream type: 6 (PES private data)
Pid 1005 Stream type: 11 (DSM-CC U-N messages)
Pid 1006 (Missing) Stream type: 11 (DSM-CC U-N me
Pid 1007 (Missing) Stream type: 11 (DSM-CC U-N me
Pid 650 Stream type: 11 (DSM-CC U-N messages)
Pid 651 (Missing) Stream type: 11 (DSM-CC U-N mess
Pid 652 (Missing) Stream type: 11 (DSM-CC U-N mess
4231 BBC TWO [BBC]
4351 BBC CHOICE [BBC]
4415 BBC NEWS 24 [BBC]
4479 BBC TEXT [BBC]
4543 BBC PARLMNT [BBC]
Service Sections
Programs
Tables
Pids

It is recommended that manipulation of programs and elementary streams should take place from the Program view.

Tables View

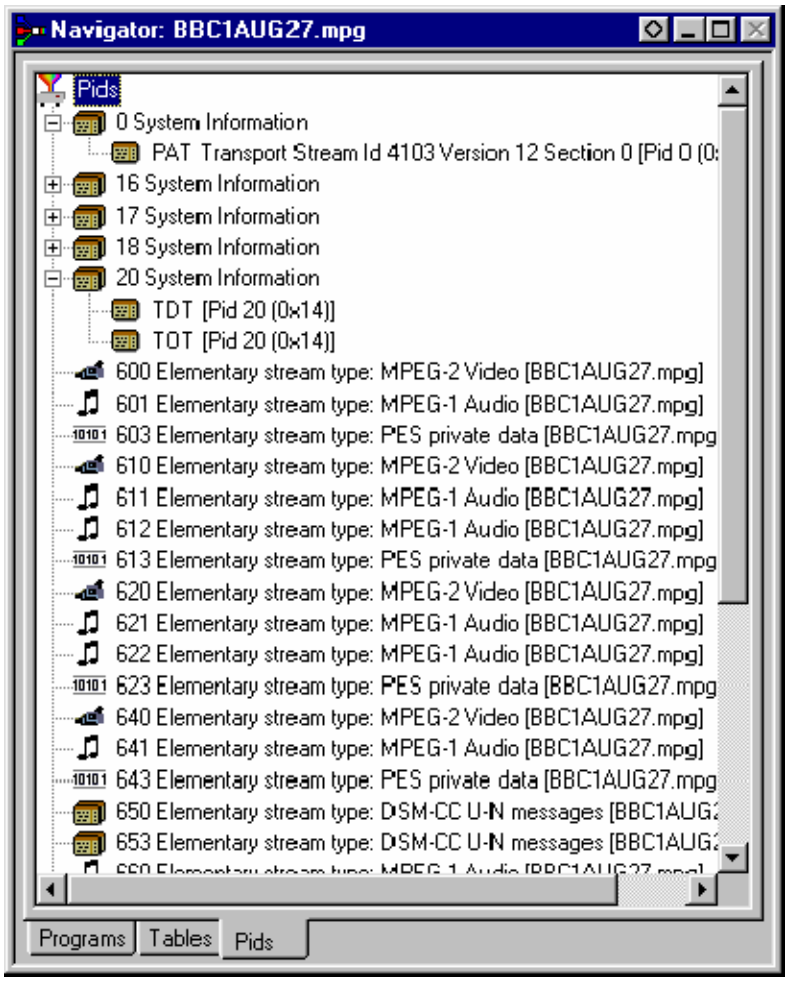
The Tables view displays high-level structure of the Program and System Information Protocol (PSIP), Service Information (SI), and Program Specific Information (PSI) tables. More detailed payload information can be examined and edited, for a selected section of a table, using the Section View.


Navigator: BBC1AUG27.mpg
PSI/SI Tables
EIT_actual_pf
Table ID 0x4e Service ID 4167 Version 22 Section 0 [Pid 18
Table ID 0x4e Service ID 4167 Version 22 Section 1 [Pid 18
Table ID 0x4e Service ID 4231 Version 12 Section 0 [Pid 18
Table ID 0x4e Service ID 4231 Version 12 Section 1 [Pid 18
Table ID 0x4e Service ID 4351 Version 1 Section 0 [Pid 18
Table ID 0x4e Service ID 4351 Version 1 Section 1 [Pid 18
Table ID 0x4e Service ID 4415 Version 13 Section 0 [Pid 18
Table ID 0x4e Service ID 4415 Version 13 Section 1 [Pid 18
Table ID 0x4e Service ID 4479 Version 9 Section 0 [Pid 18
Table ID 0x4e Service ID 4479 Version 9 Section 1 [Pid 18
Table ID 0x4e Service ID 4543 Version 18 Section 0 [Pid 18
Table ID 0x4e Service ID 4543 Version 18 Section 1 [Pid 18
EIT_other_pf
NIT_actual
Network ID 12290 Version 3 Section 0 [Pid 16 (0x10)]
PAT
Transport Stream Id 4103 Version 12 Section 0 [Pid 0 (0x0)]
PMT
SDT_actual
Transport Stream ID 4103 Version 3 Section 0 [Pid 17 (0x11)]
SDT_other
TDT
[Pid 20 (0x14)]
Programs
Tables
Pids

Any PSI/SI information that the program cannot confidently analyze, will be shown in the PIDs view.

PIDs View

The PIDs view displays the PIDs contained in the stream. The PIDs are displayed in ascending numerical order.

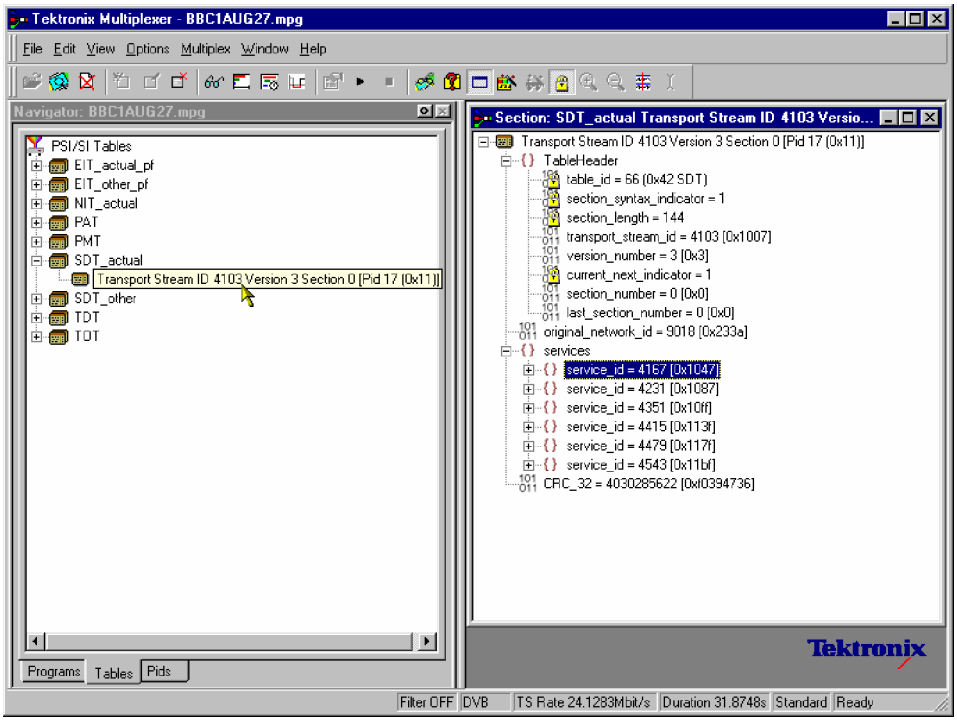

Navigator: BBC1AUG27.mpg
Pids
0 System Information
PAT Transport Stream Id 4103 Version 12 Section 0 [Pid 0 (0
16 System Information
17 System Information
18 System Information
20 System Information
TDT [Pid 20 (0x14)]
TOT [Pid 20 (0x14)]
600 Elementary stream type: MPEG-2 Video [BBC1AUG27.mpg]
601 Elementary stream type: MPEG-1 Audio [BBC1AUG27.mpg]
603 Elementary stream type: PES private data [BBC1AUG27.mpg
610 Elementary stream type: MPEG-2 Video [BBC1AUG27.mpg]
611 Elementary stream type: MPEG-1 Audio [BBC1AUG27.mpg]
612 Elementary stream type: MPEG-1 Audio [BBC1AUG27.mpg]
613 Elementary stream type: PES private data [BBC1AUG27.mpg
620 Elementary stream type: MPEG-2 Video [BBC1AUG27.mpg]
621 Elementary stream type: MPEG-1 Audio [BBC1AUG27.mpg]
622 Elementary stream type: MPEG-1 Audio [BBC1AUG27.mpg]
623 Elementary stream type: PES private data [BBC1AUG27.mpg
640 Elementary stream type: MPEG-2 Video [BBC1AUG27.mpg]
641 Elementary stream type: MPEG-1 Audio [BBC1AUG27.mpg]
643 Elementary stream type: PES private data [BBC1AUG27.mpg
650 Elementary stream type: DSM-CC U-N messages [BBC1AUG
653 Elementary stream type: DSM-CC U-N messages [BBC1AUG
Programs
Tables
Pids

PSI/SI table types are identified in the section nodes of System Information nodes

Elementary stream PIDs are identified by source and type where possible.

Section View

The Section View displays the contents of the section currently selected in any of the Navigator views.

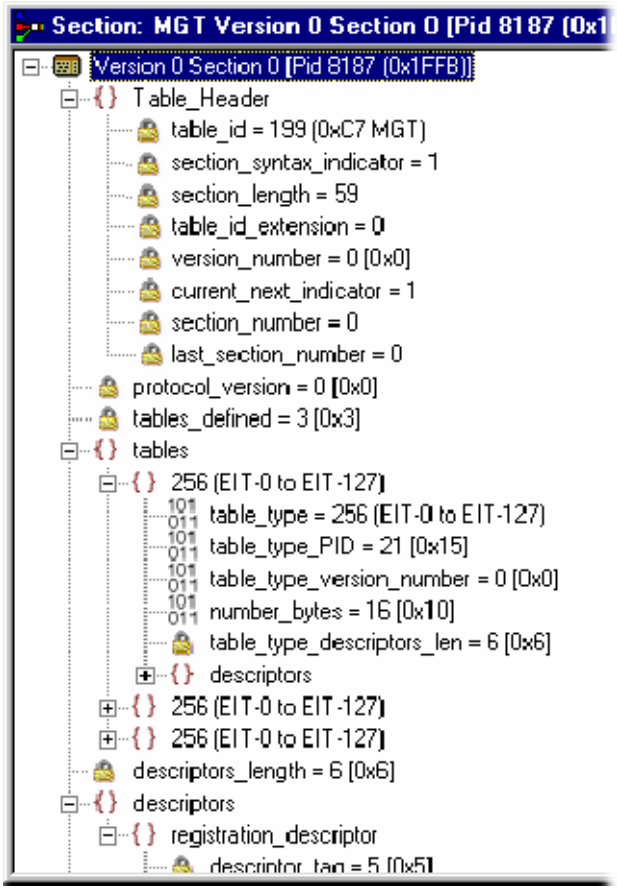


The Section view is dynamic in that it will be instantly refreshed if a new section is highlighted in the Navigator view. If no section is selected, the Section view will be blank.

The lock icon - - adjacent to certain elements of the table in the Section view indicates those items that have restricted access due to the mode of user operation: Expert or Standard.

Syntax of a Section

The adjacent diagram shows a screenshot of a section from a Master Guide Table (MGT).



The syntax specified for an MGT in the ATSC standard A65 is:

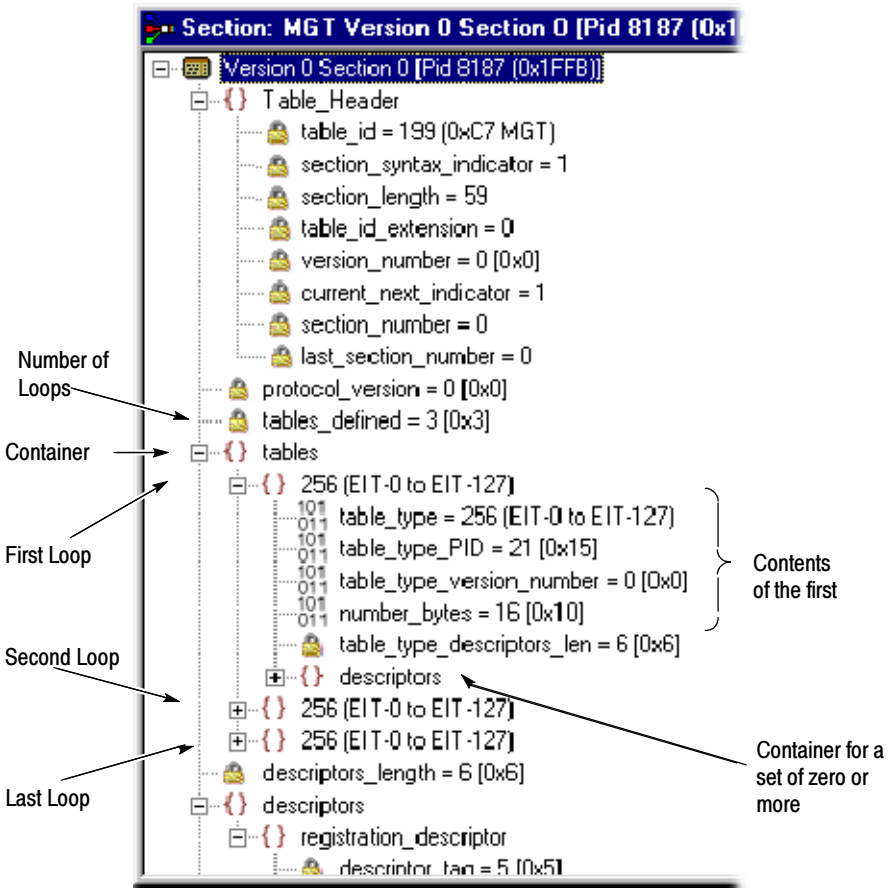
```
master_guide_table_section () {
    table_id
    section_syntax_indicator
    private_indicator
    zero
    section_length
    table_id_extension
    reserved
    version_number
    current_next_indicator
    section_number
    last_section_number
    protocol_version
    tables_defined
```

```
    for (i=0;i<tables_defined;i++) {
       table_type
       reserved
       table_type_PID
       reserved
       table_type_version_number
       number_bytes
       reserved
       table_type_descriptors_length
       for (k=0;k<N;k++)
          descriptor()
    }
    reserved
    descriptor tag
    descriptors_length
    for (I = 0;I< N;I++)
       descriptor()
    CRC_32
}
```

The terms used in this manual to describe the components, represented by nodes, in the structure diagram are:

Container	A term used to describe a node in the structure diagram which may contain zero, one or more loops. It is analogous to the for (i=0;i<loops_defined;i++) statement used to describe the syntax of a table in the ATSC standards. The container is always preceded by a field which specifies the number of loops it contains.
Loop	Describes a data structure composed of a specified set of fields and subordinate loops. The structure diagram shows each loop as a node with the fields and sub-ordinate loops as children. Each loop node in the section view represents one iteration of the loop body (the contents of the curly braces { }) in the syntax specified by the ATSC standards.
Field	Fields are referred to in the standards documents as both data items and fields. They are the smallest pieces of information that make up a table.

For example, taking an MGT that defines three tables, the Section View represents the syntax and contents of the Tables container like this:



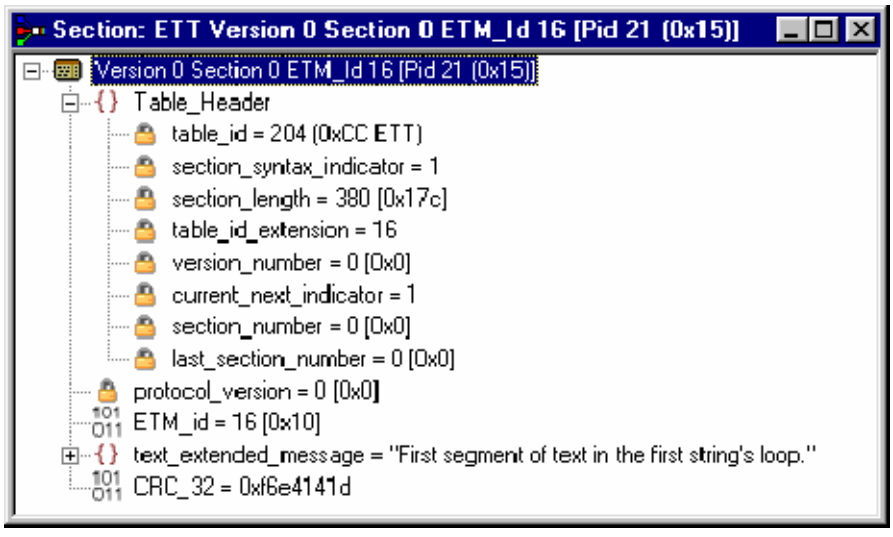
The loop for the first table, EIT-0 has been expanded to show the fields and subordinate loops that it contains.

Syntax of a Multiple String Structure

The ATSC standard A65 defines a data structure called the Multiple String Structure. An instance of this structure may contain zero or more strings and each string may contain zero or more segments. The syntax specified for a Multiple String Structure in A65 is:

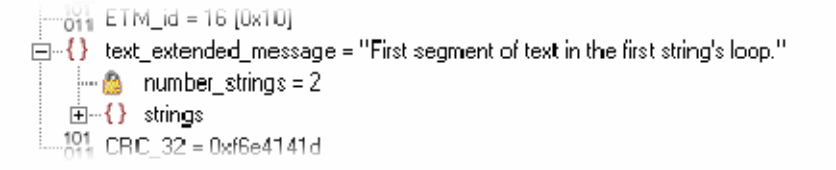
```
multiple_string_structure () {
    number_strings
    for (i= 0;i< number_strings;i++) {
        ISO_639_language_code
        number_segments
            for (j=0;j<number_segments;j++) {
        compression_type
            mode
            number_bytes
            for (k= 0;k<number_bytes;k++)
                compressed_string_byte [k]
        }
    }
}
```

Using the notation of container, loop, and field nodes, Section View represents the Multiple String Structure in the same way as any other data structure. For example: an Extended Text Table (ETT) carries its extended_text_message in a Multiple String Structure. The default view of a section of an ETT in the Section View looks like this:

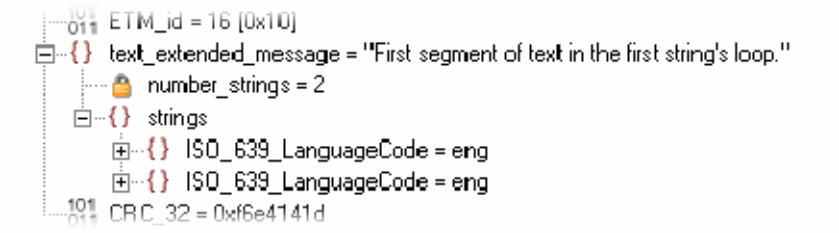

Section: ETT Version 0 Section 0 ETM_Id 16 [Pid 21 (0x15)]
Version 0 Section 0 ETM_Id 16 [Pid 21 (0x15)]
Table_Header
table_id = 204 (0xCC ETT)
section_syntax_indicator = 1
section_length = 380 [0x17c]
table_id_extension = 16
version_number = 0 [0x0]
current_next_indicator = 1
section_number = 0 [0x0]
last_section_number = 0 [0x0]
protocol_version = 0 [0x0]
ETM_id = 16 [0x10]
text_extended_message = "First segment of text in the first string's loop."
CRC_32 = 0xf6e4141d

Section view displays a node for the extended_text_message with as much as possible of the first segment from the first string.

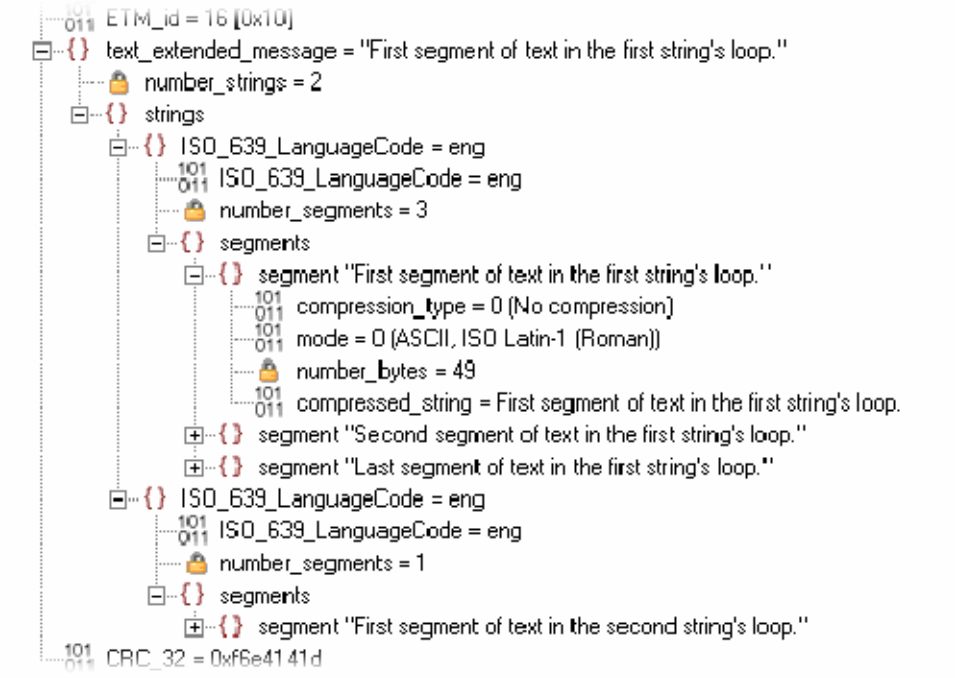
Expanding the node reveals a number_strings field which specifies the number of strings and a container which holds them (strings):


ETM_id = 16 (0x10)
text_extended_message = "First segment of text in the first string's loop."
number_strings = 2
strings
CRC_32 = 0xf6e4141d

The number_strings field shows that there are two strings in this example. Expanding the strings container shows the loop for each string. From this it can be seen that both strings are in English.


ETM_id = 16 (0x10)
text_extended_message = "First segment of text in the first string's loop."
number_strings = 2
strings
ISO_639_LanguageCode = eng
ISO_639_LanguageCode = eng
CRC_32 = 0xf6e4141d

Expanding each of the strings reveals the number of segments (number_segments) that make up each string and a segments container. Similarly, expanding the segments container reveals segments.



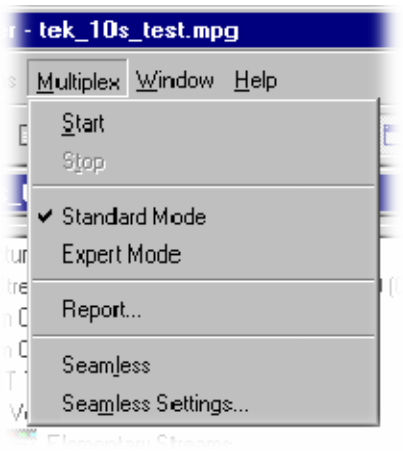
The contents of each segment loop define what compression and character set are used, followed by the actual text. The text is held in the compressed_string field.

Expert and Standard Modes

The Multiplexer has two modes of operation for conformance checking when editing table contents. These are selected from the Multiplex menu. The checks that affect the Navigator are:

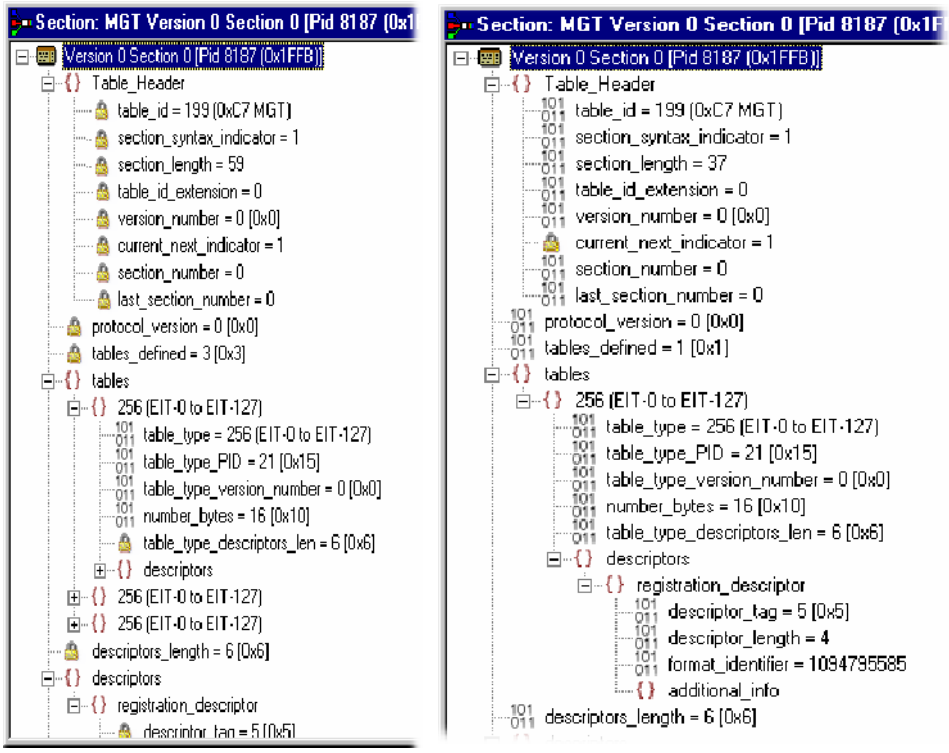
Standard Mode: Prevents changing the PID of a table whose PID number is specified in the standard, for example, PID 0x0 carries the PAT.

Expert Mode: A warning is displayed and confirmation requested before changing the PID of a table whose PID number is specified in the standard.



An adjacent check mark indicates the mode selected. The mode is also indicated on the Status Bar.

In the Section View a padlock symbol is displayed adjacent to all of the fields that cannot be edited in the current mode. For example, the screenshots below show the same tables in Standard and Expert mode.



Standard Mode Expert Mode

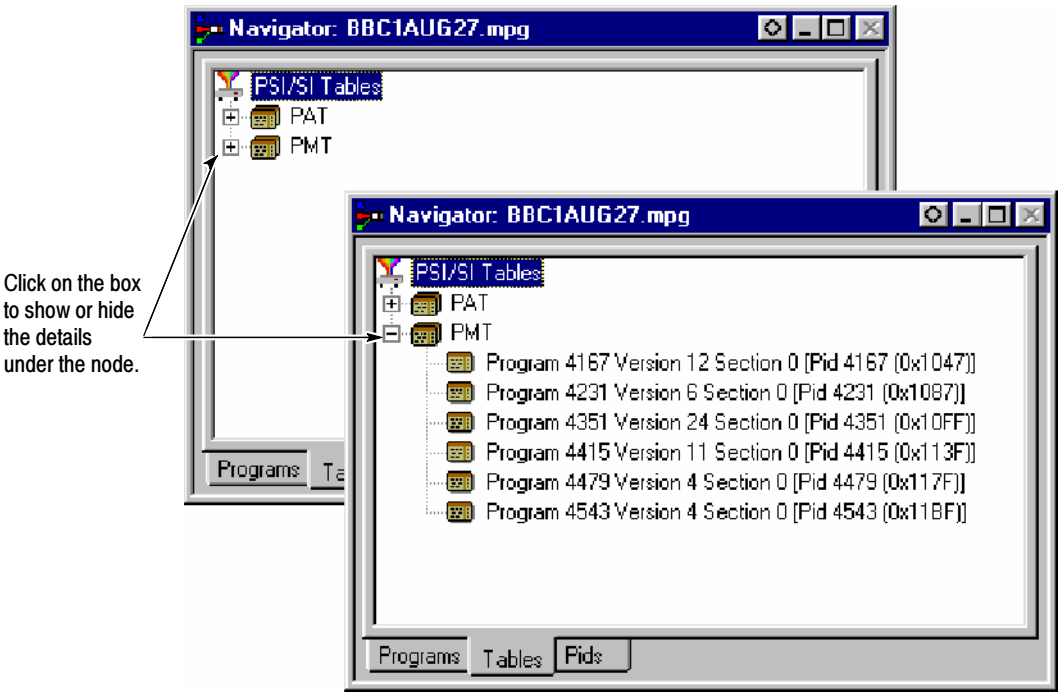
NOTE. *current_next_indicator in both Standard and Expert mode cannot be edited. This is because the field is affected solely by the Section Properties concerned with Version Timing (see* Version Timing*, page 8-87).*

The selected mode is also reflected in the Wizards that are used to facilitate creation of multiplexes. Elements that are restricted in the tables in Standard mode will also be restricted in the relevant wizard. Similarly, elements that are enabled in Expert mode will be enabled in the associated Wizard.

NOTE. *The section view may need to be closed and reopened in order to update the padlock icons.*

Structure Diagram Manipulation

A tree diagram, with the “root node” or highest level component at the top represents the Transport Structure. A square box indicates components that contain more information beneath them in the structure.


Navigator: BBC1AUG27.mpg
PSI/SI Tables
PAT
PMT
Programs
Navigator: BBC1AUG27.mpg
PSI/SI Tables
PAT
PMT
Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)]
Program 4231 Version 6 Section 0 [Pid 4231 (0x1087)]
Program 4351 Version 24 Section 0 [Pid 4351 (0x10FF)]
Program 4415 Version 11 Section 0 [Pid 4415 (0x113F)]
Program 4479 Version 4 Section 0 [Pid 4479 (0x117F)]
Program 4543 Version 4 Section 0 [Pid 4543 (0x11BF)]
Programs
Tables
Pids
Click on the box to show or hide the details under the node.

Clicking on the box does not select that node. It only shows or hides the next level of detail under that node.

If the node has a minus sign in the box the level of detail below it is currently displayed. The lower level(s) may be hidden by clicking the mouse pointer on the box.

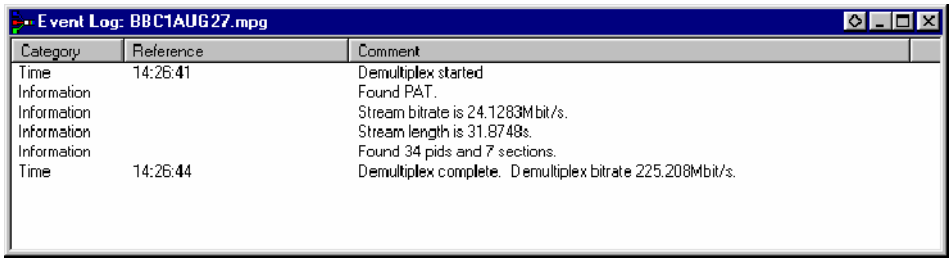
If the box contains a plus sign, there is another level in the node that is currently hidden. Click the mouse pointer on the box to display the next level of information under the node.

Components that are connected to a branch of the tree without a square box are leaf nodes; the accompanying icon indicates the node type. They display the lowest and finest level of detail available in this diagram. These are either a Section of a Table or a PID.

Fields in the Section view that may not be edited directly are indicated by a padlock symbol, . This protection can be switched off by selecting Expert Mode from the Multiplex menu. It can be reenabled by selecting Standard Mode.

Event Log

Messages about significant events are written to the Event Log from the time a file is first opened. The Event Log can be opened for viewing at any time during or after the initial analysis. When the initial analysis is done, the mean transport rate, bit rate for each PES PID, and a Demultiplex complete message are written in the Event Log.



The start and end times for generating a new transport stream are shown by the Multiplexer started and Multiplexer completed messages.

Note that when demultiplexing and multiplexing streams, the bit rate at which the demultiplex or the multiplex is performed is given. This is in addition to the stream bit rate derived from the stream itself.

When synthesizing a new transport stream any errors or warnings about the new stream are written to the Event Log between the start and completed messages.

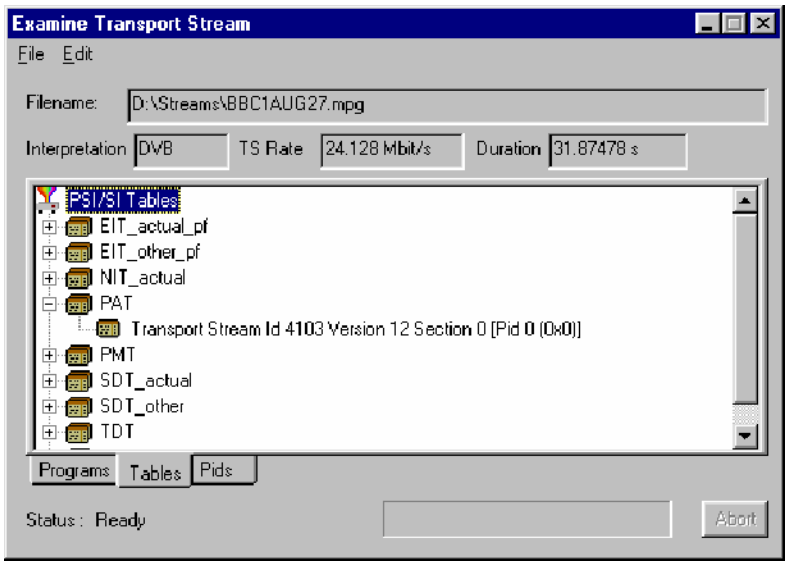
The Category column indicates the type of event. The subject or time of the event is shown in the Reference column and the details are given in the Comment column.

The complete text can be copied onto the windows clipboard, using the Copy option from the right-click menu. The text can also be cleared with the Clear command. Both commands are also available from the Edit menu.

Examine Transport Stream Window

The Examine Transport Stream (Examine TS) window (File > Examine TS) performs two main functions within the Multiplexer:

- It allows you to take an overview of a transport stream before subjecting it to full analysis.
- It allows tables and programs to be dragged and dropped from the examined stream to the file that is currently open in Multiplexer.



Menu Bar

The Examine TS window menu bar comprises only two items: File and Edit.

File Menu. Table 8–11 lists the items in the File menu.

Table 8-11: Examine TS - File menu options

Command	Function
Open...	Analyzes and opens the selected file in the Examine TS window. Closes the current file.
Exit	Closes the Examine TS window.

Edit Menu. Table 8–12 lists the items in the Edit menu.

Table 8-12: Examine TS - Edit menu options

Command	Function
Copy	Copies the currently highlighted section to the clipboard.

File Summary

These fields provide a brief summary of the analyzed file.

Filename: The filename of the examined stream.

Interpretation: The interpretation applied to the stream. This is the same as that selected in the Multiplexer application via the View menu: MPEG-2, DVB,ATSC or ISDB.

TS Rate: The transport stream bit rate derived from the stream.

Duration: The duration of the transport stream.

Status: The status of the stream analysis.

Navigator Views

The Examine TS Navigator views correspond to the Navigator views in the main application. Programs, Tables and PIDs are shown as they would be after a full analysis. The PSI/SI tables are expanded and collapsed in the same manner. The Section view is not available in the Examine TS window.

Examine TS Section Copy

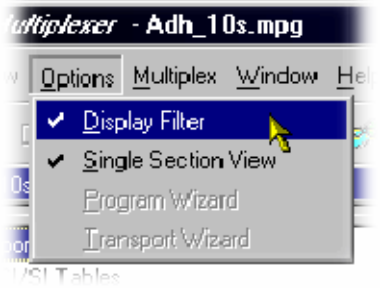
While examining transport streams, it is possible to copy sections to the main multiplex using the standard Windows techniques: copy and paste or by dragging and dropping them with the aid of the mouse.

For example, to import a section that is visible in the Examine TS window into the new multiplex configuration:

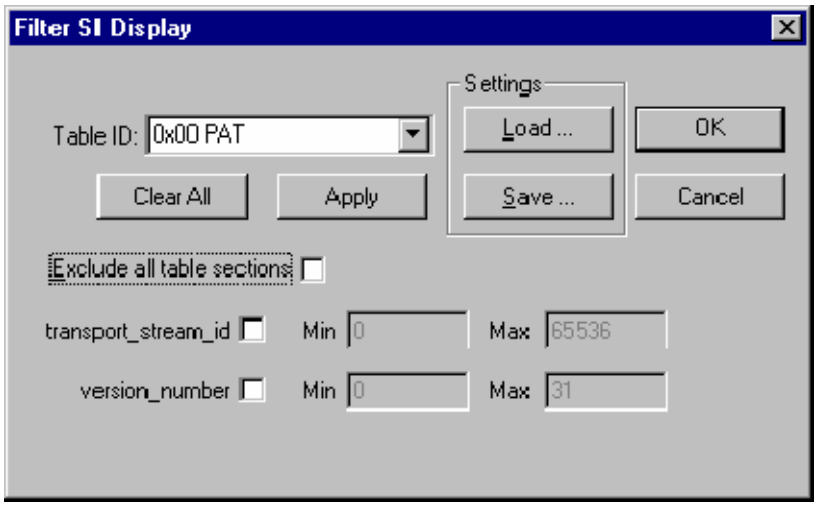
1. Select the Navigator Tables view.
2. Highlight the section to be copied in the Examine TS window and do one of the following:
   - Select Edit > Copy. With the Navigator Tables view active, select Edit > Paste.
   - Using the mouse, place the cursor over the highlighted section, press and hold the left button on the mouse and drag the section onto the Navigator Tables view. Release the mouse button.
3. Note that the copied section is placed in the PSI/SI structure at the correct location. If any conflict arises concerning similar PID numbers, a new version is created.

SI Filtering

Table elements can be excluded from the Navigator Tables view using the Display Filter available through Options > Display Filter.

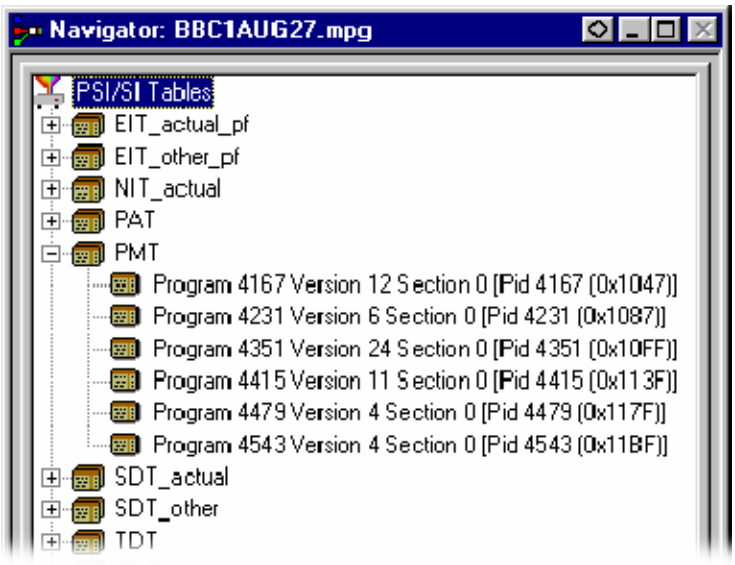


The following dialog box is displayed:

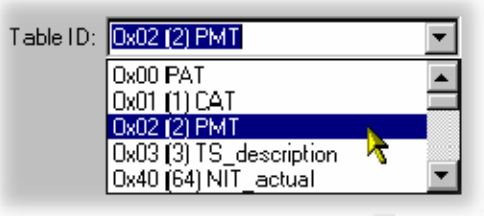


Selecting a Table for Filtering

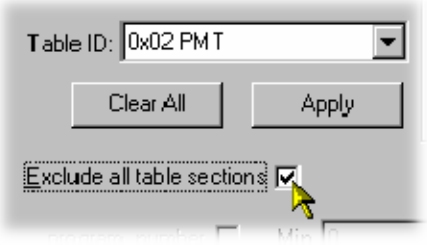
Example: Before filtering, the stream tree may be as shown below:


Navigator: BBC1AUG27.mpg
PSI/SI Tables
EIT_actual_pf
EIT_other_pf
NIT_actual
PAT
PMT
Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)]
Program 4231 Version 6 Section 0 [Pid 4231 (0x1087)]
Program 4351 Version 24 Section 0 [Pid 4351 (0x10FF)]
Program 4415 Version 11 Section 0 [Pid 4415 (0x113F)]
Program 4479 Version 4 Section 0 [Pid 4479 (0x117F)]
Program 4543 Version 4 Section 0 [Pid 4543 (0x11BF)]
SDT_actual
SDT_other
TDT

In the Filter SI Display dialog box, table identities are listed in the Table Id: drop-down menu.

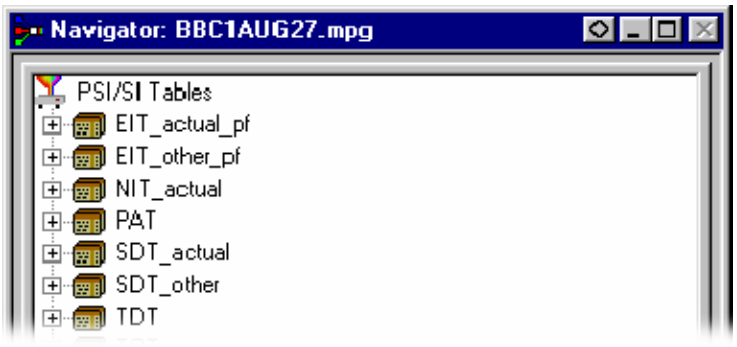


All sections of a table can be excluded by enabling the Exclude all table sections checkbox.



To preview the result of filtering, select the Apply button.

Note that all reference to the PMT tables is removed - as shown below:

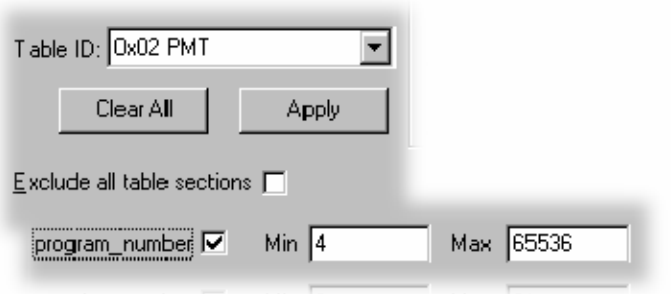


To exclude a range of sections, enable the section by selecting from the Table ID drop-down list and entering the required range.

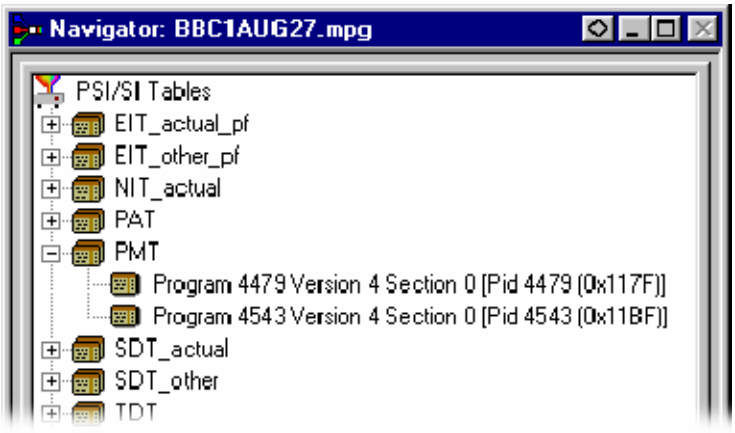
Note that section names shown in the dialog box change according to which table is selected.

To preview the result of filtering, select the Apply button.

For example, the following settings will result in the display shown overleaf:



***NOTE**. Minimum and maximum values may be entered in either decimal (12345) or hexadecimal (0xA12B) format.*



The parameters for each table must be set individually. Overall settings can be applied individually by selecting the Apply button when a setting is made or as a whole by making all of the settings and selecting the OK button.

To preview the result of filtering, select the Apply button. All settings can be cleared by selecting the Clear All button.

Note that filter settings remain in force for as long as the current multiplex is active. The settings are lost when the Multiplexer is closed unless they have been previously saved.

Saving/Loading SI Filter Settings

The filter settings made in the Display Filter dialog box can be saved and subsequently reapplied to the same stream or other streams.

To save the current filter settings, select the Save button and enter a name (and location) in the Save As dialog box. To retrieve or load filter settings, select the Load button and identify the filter file in the Open dialog box. The file extension *.fil is used.

Component Views

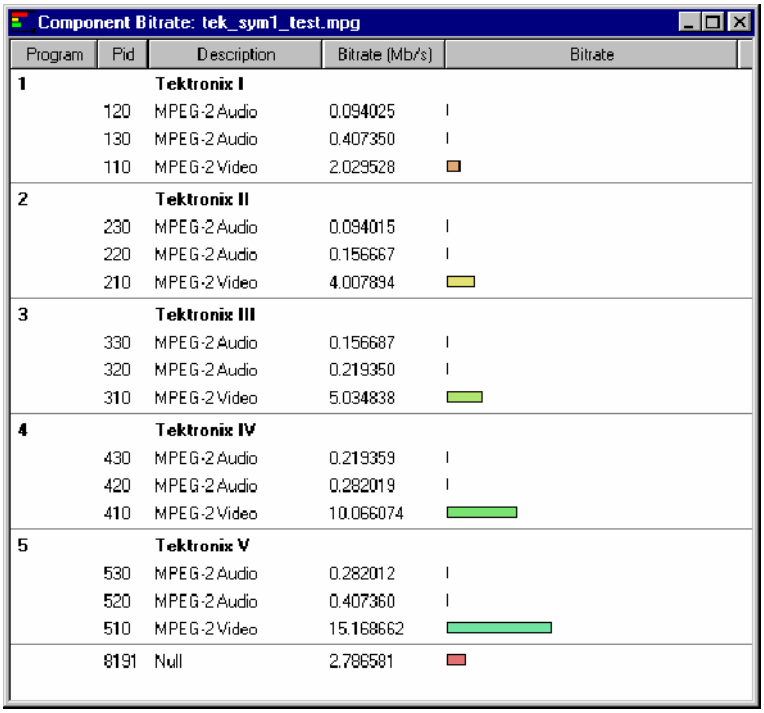
The Component views provide a graphical view of the bit rate and duration of the components of a stream. The management of the views has a number of common features; these are described in the Common Features, page 8–71 .

Component Bitrate

The Component Bit rate view provides a graphical comparison of the stream components.

Open the Component Bit rate view either by selecting View > Component Bitrate from the Menu Bar or the toolbar button.

Each component includes the following information: Program name, PID, Description and the Bit rate in numerical and graphical form. Where appropriate, the Service ID and the Service Name is displayed (extracted from the SDT).

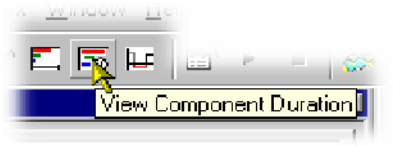


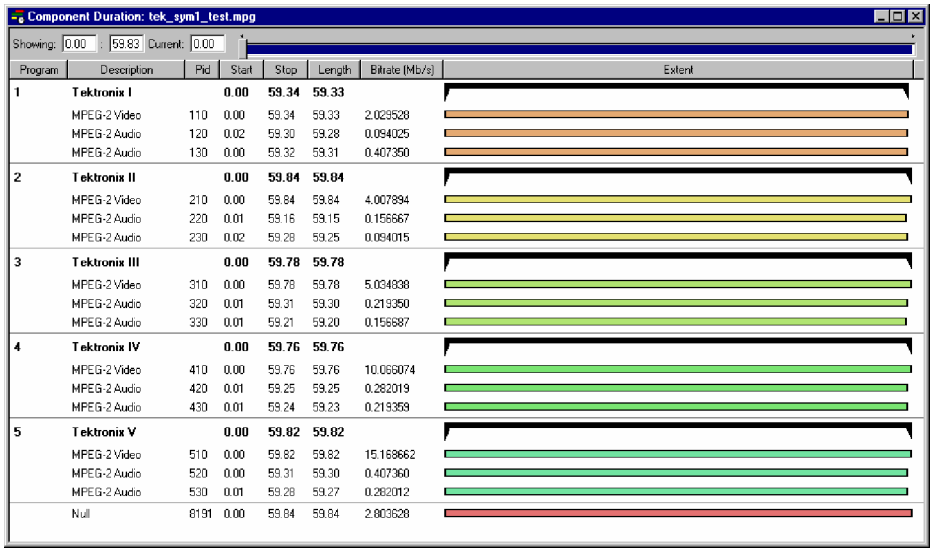
Program	Pid	Description	Bitrate (Mb/s)	Bitrate
1		**Tektronix I**		
	120	MPEG-2 Audio	0.094025	
	130	MPEG-2 Audio	0.407350	
	110	MPEG-2 Video	2.029528	
2		**Tektronix II**		
	230	MPEG-2 Audio	0.094015	
	220	MPEG-2 Audio	0.156667	
	210	MPEG-2 Video	4.007894	
3		**Tektronix III**		
	330	MPEG-2 Audio	0.156687	
	320	MPEG-2 Audio	0.219350	
	310	MPEG-2 Video	5.034838	
4		**Tektronix IV**		
	430	MPEG-2 Audio	0.219359	
	420	MPEG-2 Audio	0.282019	
	410	MPEG-2 Video	10.066074	
5		**Tektronix V**		
	530	MPEG-2 Audio	0.282012	
	520	MPEG-2 Audio	0.407360	
	510	MPEG-2 Video	15.168662	
	8191	Null	2.786581	

Component Duration

The Component Duration view provides a graphical view of the timing and duration of each program/component within the current stream. Adjustments can be made to the duration of each component.

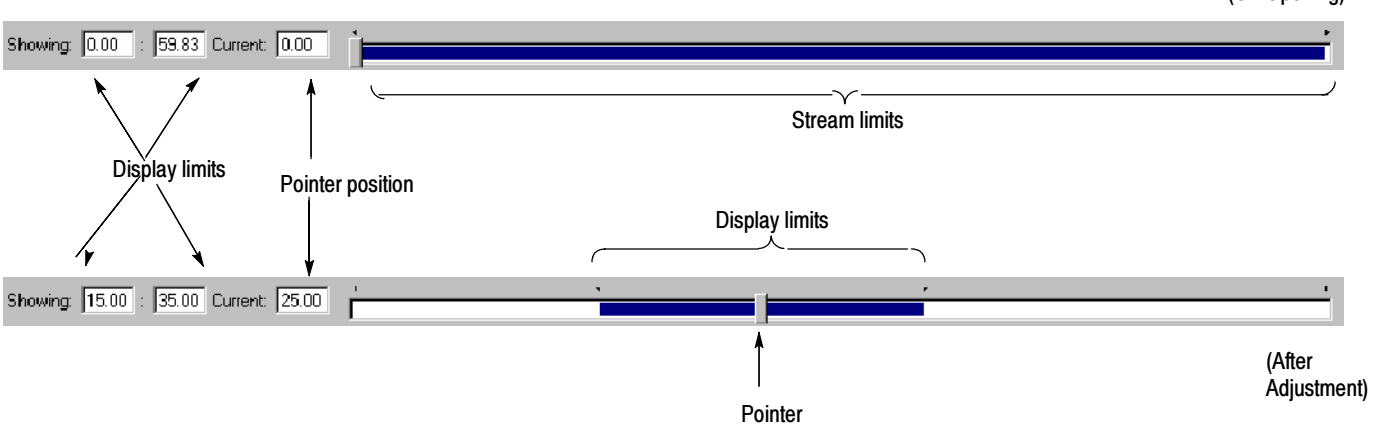
Open the Component Bit rate view by selecting either View > Component Duration from the Menu Bar or the toolbar button.





The following data is displayed for each component of the stream: Program, Description, PID, Start and Stop time (in numerical and graphical form), Length and Bit rate. The timing and bit rate elements of this information are also available in the Program Stream Properties dialog box. (See *Program Content dialog box*, page 8-35.)

Scaling Bar. The Scaling bar, which is displayed at the top of the Component Duration view, allows you to select the portion of the transport stream that is to be displayed.



The *Stream limits* bar represents the full extent of the stream. The *Display limit*s bar (dark portion) indicates the portion of the stream that is currently displayed in the body of the view.

The *Display limits* fields indicate the extents of the *Display limits* bar and the current Pointer position.

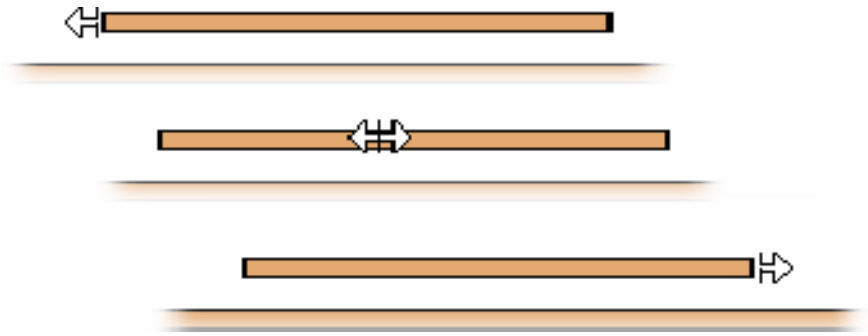
The Pointer can be dragged to a new position on the Stream limits bar. The Display limits bar will center on the Pointer.

Clicking to the right or left of the Pointer will cause it to move to the left or right respectively.

Duration Control. The duration of each element in the stream is given by the Start and Stop values and shown graphically by the associated bar. The components are color coded according to which program group they belong to.

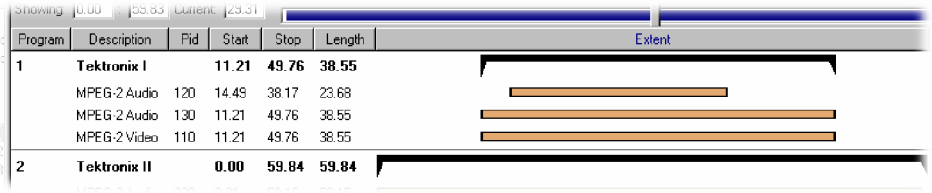
The Start, Stop and Length values can be changed by clicking on the appropriate field and entering the required value. The associated bar will reflect the change.

The Start, Stop and Length values can also be changed graphically by manipulating the bar. The cursor shape indicates what action can be taken.



The changes are reflected in the associated field values.

Components can be changed individually. In addition, whole Program groups can be changed by manipulating the Program duration bar, but only when the view is sorted by Program:



Program Duration

A vertical dotted line indicates the upper limit of the multiplexed stream.

In the Transport Stream Properties dialog box (View > Properties with the Transport Stream node highlighted in the Navigator Programs view), you can determine how and if the stream duration is updated. The options available will be:

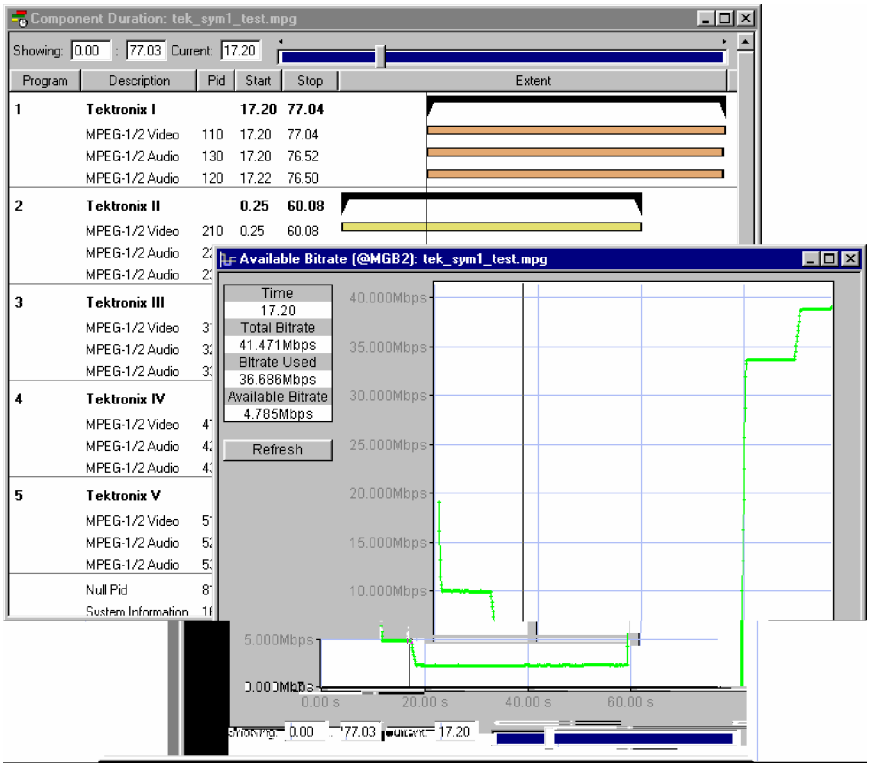
- Select Fixed to ensure that the stream duration can only be updated in the Stream Properties dialog box.
- Select Set to the greatest component stop time to ensure that the stream duration is set to the greatest stop time recorded in the SI/PSI/PSIP tables.

Component start and stop times changed in the Component Duration view are automatically updated in the SI/PSI tables.

Available Bitrate

The Available Bit rate view displays in graphical form the available bit rate for the duration of the multiplex.

The bit rate is calculated using the MGB2 measure (Ref: ETSI TR 101 290). Open the Component Bit rate view by selecting View > Available Bitrate from the Menu Bar or by using the toolbar button.



If the bit rate falls below zero, the points will be highlighted in red. When editing a multiplex, you can add components which cause the bit rate to fall below zero and no warnings will be displayed. However, if a transport stream is then generated, errors will be logged and displayed in the Log view.

Use Refresh to redraw the graph. Clicking anywhere within the graph will place a vertical cursor at that point; the position and bit rate are displayed in the Time and Available Bit rate fields.

The zoom level and cursor placement of the Available Bit rate and the Component Duration views can be synchronized by selecting View > Synchronize.

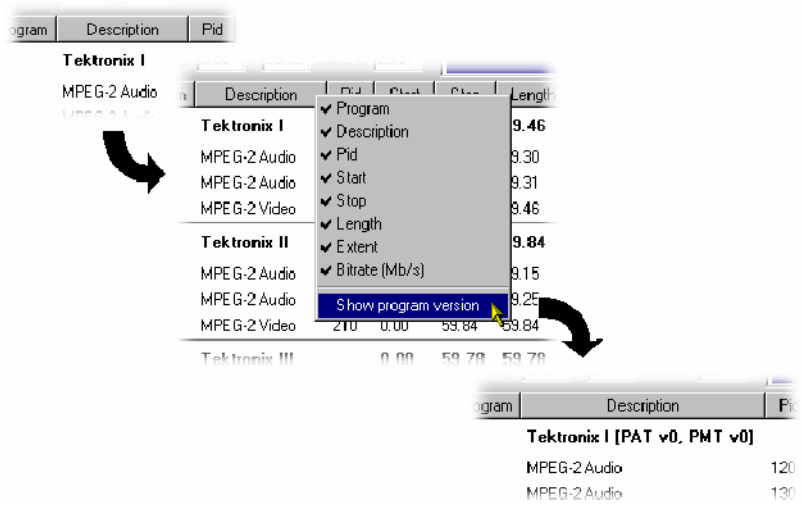
Common Features

Columns in the Component views can be sorted and rearranged to suit your preferences. Column management in the two Component views is similar.

Field Selection. You can select the fields to be displayed in each Component view. The Header bar indicates which fields are currently displayed.

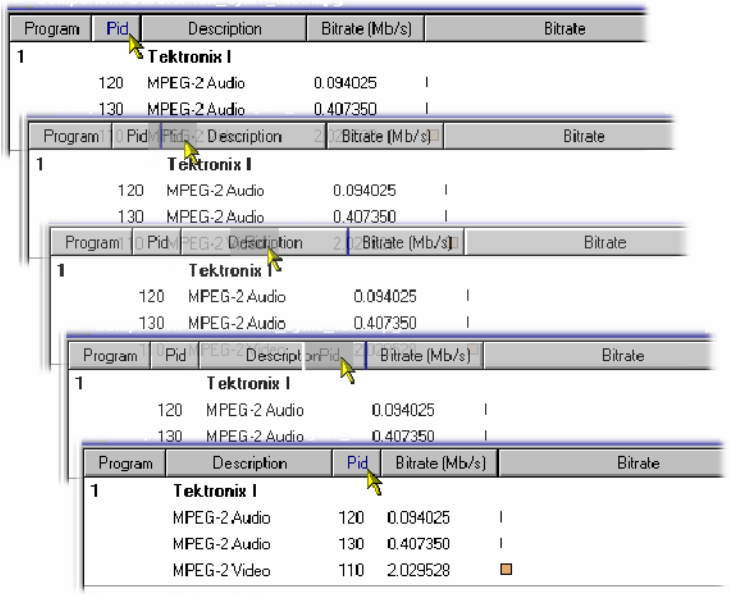
When you right-click on the Header bar, a menu is displayed. You can select which fields are to be displayed. A check-mark next to a field name indicates that the field display is currently enabled.

The version number of the PAT and PMT can be displayed in the Description column by enabling the Show program version option in the right-click menu from the Description column header.

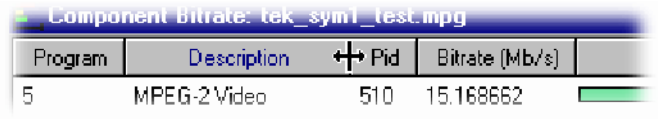


Similarly, the PID numbers can be displayed in hexadecimal, by selecting Display in hexadecimal from the PID column right-click menu.

Column Repositioning. Columns can be repositioned as required. Click and drag the column to the required position.

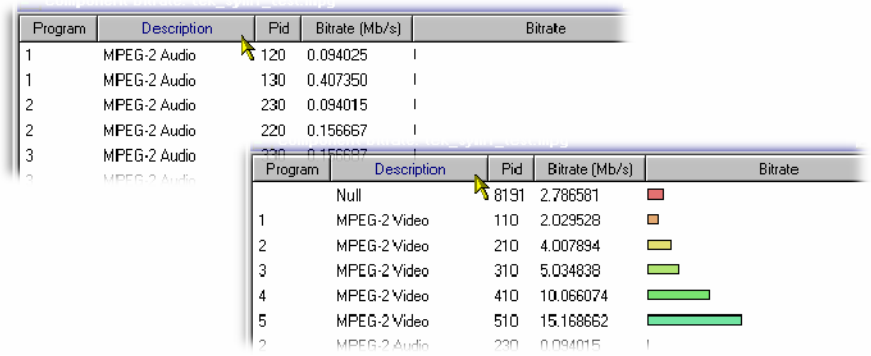


Column Width. Columns can be resized as required. Place the cursor over the dividing line between two columns; it will change to the resizing cursor. Click and drag the column to the required width. The change will be made to the column to the left of the cursor.



Double-clicking the column divider will automatically resize the column to the left to the optimum size required to view the content.

Column Sort. Columns can be sorted in ascending or descending order. Click the cursor on the heading to sort the column. Clicking again will sort the column in reverse order.



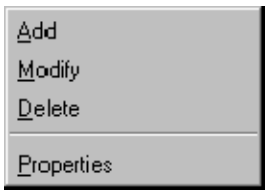
Similarly, the columns can be grouped in Program order, by clicking the Program header.

Common Menu Options

The specifications for components of the various views can be manipulated by options from the Edit menu, View Menu, and Toolbar.

There is also a right-click menu that provides the Add, Modify, Delete, Import, Export and Properties options. Place the mouse pointer over the component to change and click the right mouse button to open the menu.

A typical right-click menu is shown here:



The menu options are context-sensitive and will be enabled or disabled according to the current selection in the view.

The following options are available from the various right-click menus:

Add	Adds a component to the currently selected item.
Modify	Opens the properties dialog box.
Delete	Deletes the currently selected component.
Properties	Opens a properties dialog box for editing the currently selected item.
Export Payload	Extracts and exports the payload of the source transport stream in the form of a simple data file.
Export Elementary Stream	Removes the transport stream and PES headers and exports the remaining information in the form of a simple data file.
Export Section Data	Extracts and exports section data. The created file can be imported as ES using Multiplexer's Add function or as SI using the Import Section Data... option.
Import Section Data	Imports SI data form a file and analyzes it. The section is added to the Navigator view.

Editing in the Navigator Views

Multiplexer provides a variety of ways of building and modifying transport streams for multiplexing. In addition to the Menu Bar options and Toolbar shortcuts built into the Multiplexer, many of the operations can be carried out using familiar drag and drop Windows techniques.

In the following descriptions, the alternative methods for carrying out a task are given at the head of the section, but only one method is described for each action. Other methods for the same action often invoke the same dialog boxes and sequence of follow-on actions.

Drag and Drop

To drag a file, click on its name and hold down the left button of the mouse while dragging the file to the required location. The cursor will change according to the background that it is dragged over:

	(With Ctrl key held) when dropped, the file will be copied.
	When dropped, the file will be moved (cut and pasted).
	When dropped, no action will be taken.

Note that as the file is dragged over elements in the Navigator, receptive elements (elements where the file can be meaningfully dropped) will be highlighted.

Transport Stream

Opening an MPEG File

(See *Opening a Stream*, page 8-9)

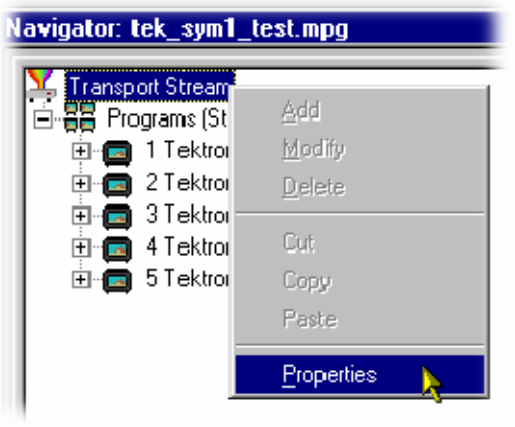
Opening a Multiplexer File

(See *Opening a Stream*, page 8-9)

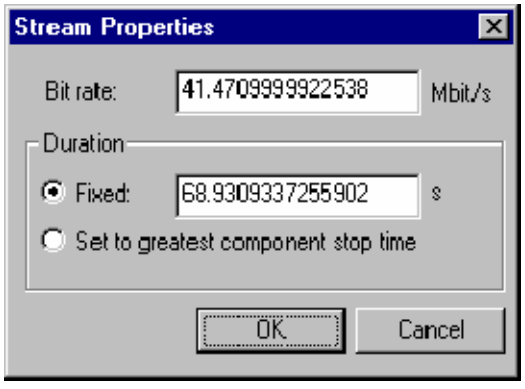
Change Transport Stream Bit rate and Duration

To specify a new bit rate or duration for the transport stream, select and highlight the Transport Structure component in the Navigator view.

From the right-click menu, select Properties. The dialog box shown below will be displayed.



Edit the Bit rate and the Duration as required, then click on the OK button.



Programs

The introduction of the Navigator Programs view has provided a more program-centered means of manipulating SI/PSI. Whole programs can be added to the multiplex and the application will update the associated tables, including the PAT and PMT.

Note that the nodes of the tree structure in the Navigator Programs view are context sensitive. When dragging and dropping files from either the Examine TS window or from another instance of Multiplexer, a node will only be highlighted as the cursor passes over it when the operation proposed is legal. Note that there may be a very short delay before the node is highlighted while the legality of the operation is checked.

Adding a New Program

With the Transport Stream ID field highlighted in the Navigator Programs view, selecting the Add option either from the right-click menu (PAT highlighted in Navigator Programs view) or the Menu Bar (Edit > Add) will open the Program Wizard (see page 8–33).

(In the Navigator Programs view, the PAT is represented by the Transport Stream ID field.)

Copy/Move a Program

Methods available:

- Drag and drop (copy only) from the Examine TS window (Programs view) to the Navigator Programs view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Programs view.

In the Navigator Programs view, programs can only be dropped onto the PAT node.

Tables

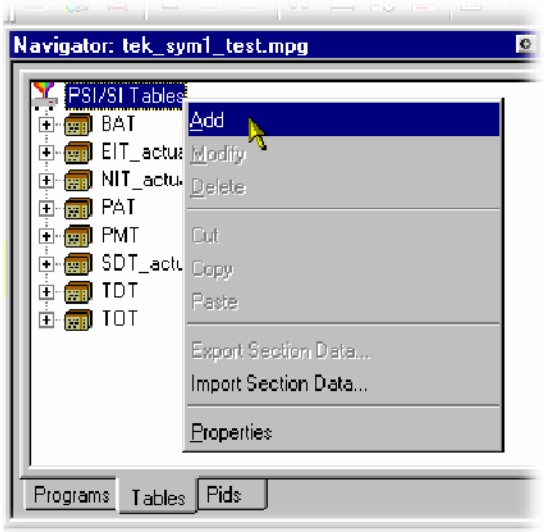
Adding a New PSI/SI Table

Methods available:

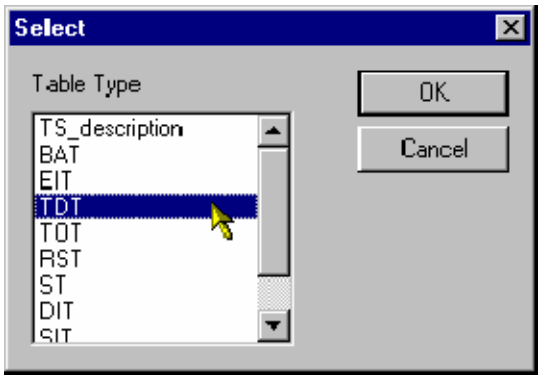
- Highlight the PSI/SI Tables level in the Navigator Tables view and select Add from the right-click menu.
- Drag and drop (copy only) from the Examine TS window (Tables view) to the Navigator Tables view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Tables view.

Any Table that is defined in the selected standards, and not already present, can be added the transport stream. To add a table to the transport stream, click on PSI/SI Tables in the Navigator Tables view:

1. Highlight the PSI/SI Tables level and select Add from the right-click menu.



This will open the Select dialog box. The dialog box displays a list of the table types that are not already present in the stream.

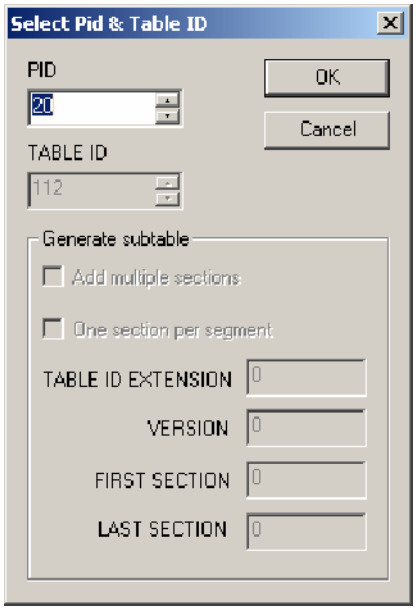


2. Highlight the required table type and then select the OK button.

   Pressing Cancel will abandon the operation without adding a new table.

   Only the table types that are not currently specified for the stream are listed. If the required table type is not listed, press the Cancel button to close the dialog box without affecting the specification for the stream.

   The Select PID & Table ID dialog box is displayed only if a PID and/or Table ID need to be identified. Otherwise, the selected Table type is automatically created.



A single section is automatically added to the newly created table type.

Copying a PSI/SI Table

Methods available:

- Drag and drop (copy only) from the Examine TS window (Tables view) to the Navigator Tables view
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Tables view

Tables can be copied (or moved) from existing multiplexes, using either of the available methods.

If a similar table type is already present in the multiplex, the contents of the copied table will be integrated with it.

Deleting a PSI/SI Table

A table is automatically removed when the last section is deleted (see page 8-89).

Exporting a Table

(See *Exporting a Section*, page 8-90.)

Importing a Table

(See *Importing a Section*, page 8-91)

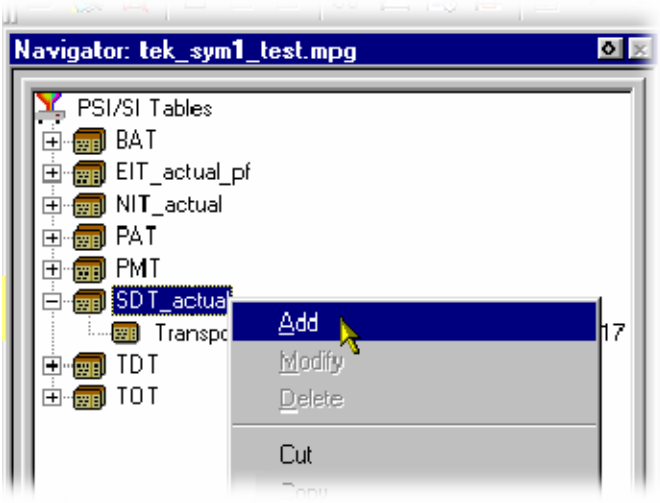
Sections

Adding a New Section to a PSI/SI Table

Methods available:

- Highlight the parent table level in the Navigator Tables view and select Add from the right-click menu.
- Drag and drop (copy only) from the Examine TS window (Tables view) to the Navigator Tables view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Tables view.

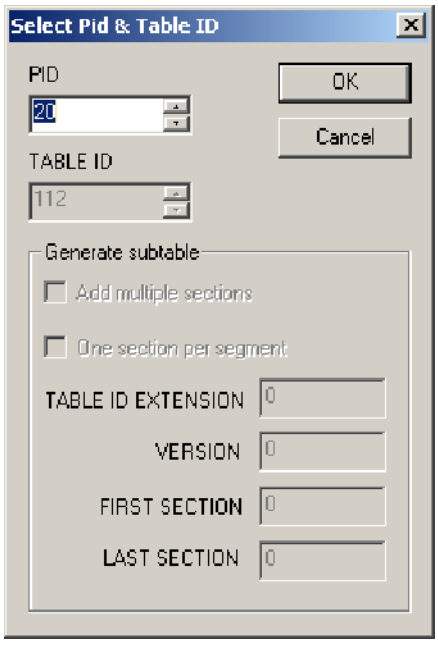
To add a section to a table, select the parent table in the Navigator Tables view. For example, to add a section to the SDT, select SDT Tables:



Then select Add from the right-click menu.

The Select PID & Table ID dialog box is displayed only if a PID and/or Table ID need to be identified. Otherwise the selected section is automatically created.

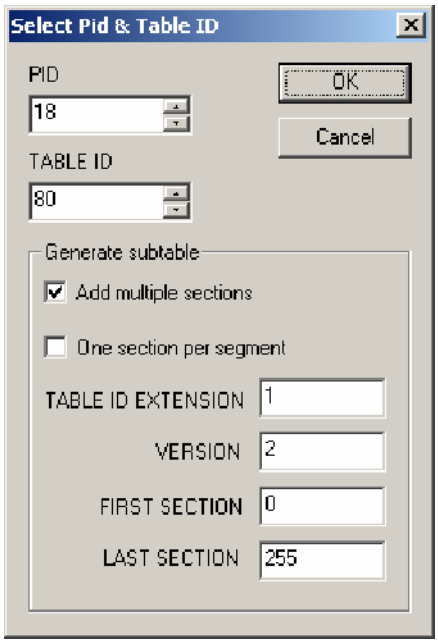
Select the required PID and Table ID (where enabled) and press OK.



Pressing Cancel will abandon the Add operation without adding a new section.

The version/section of a table is created with a new version or section number. The rules used by Multiplexer for numbering are:

- For tables that the selected standard dictates should always have a section number of 0, the version number is increased by one. The new version number is based on the version currently in the table with the most recent number. The version_number is a 5-bit field, so if the new version would be 32, it is reset back to 0.
- version_numberNEW = (version_numberRECENT + 1) modulo 32
- For any table type that allows a section_syntax_indicator, the Add multiple sections checkbox in the Generate subtable part of the dialog box is enabled. Additionally, the One section per segment checkbox will only be enabled for the EIT schedule table type.

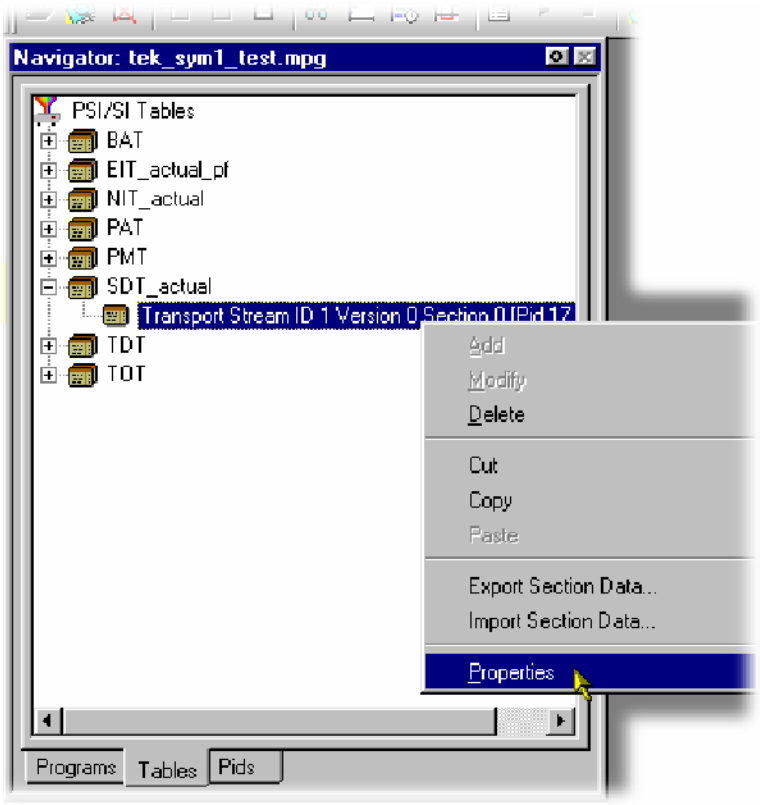


- Up to 256 sections can be added.
- Additions to existing subtables using the same Table Id Extensions and Versions will be rejected.
- When multiple EIT Schedule sections are being added, the One section per segment checkbox is enabled. When it is checked, only the first section in each segment will be created, rather than all sections numbered between First section and Last section.

When dragging and dropping a section, the Multiplexer will resolve any numbering conflicts by creating new versions of duplicated tables.

Editing PSI/SI Table Properties

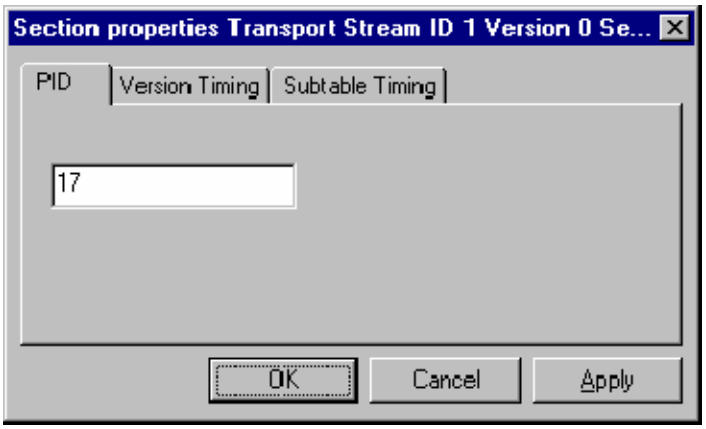
Table and Section Properties are edited by selecting and highlighting one of the versions/section within the transport structure and selecting the Properties option from the right-click menu.



This opens a dialog box with four tabs, one for each property. Depending on the type of table, properties can be applied to a specific version or section of the table. Multiplexer only allows operations that make sense in the context of the selected table type.

The properties that can be edited from the Navigator Tables view are:

PID Number. The PID tab is displayed by default when the Section Properties dialog box is opened.

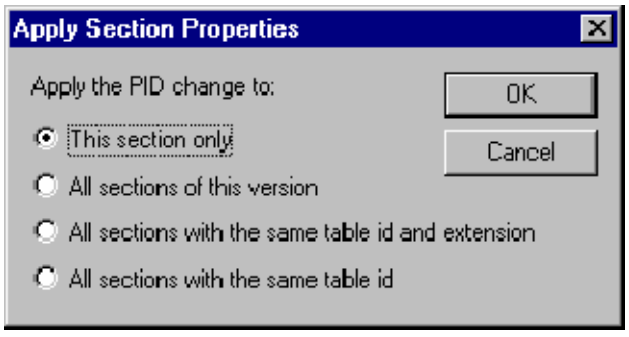


Edit the value and select OK to change the PID number.

Edit the value and select Apply to make the changes and update the other properties (tabs) without having to close this dialog box.

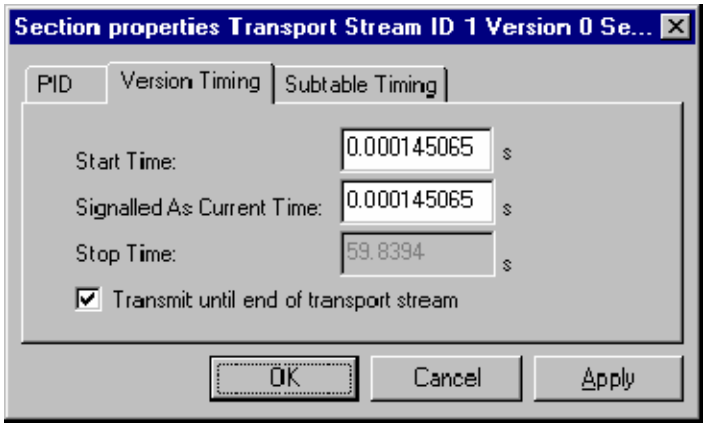
Multiplexer checks the new PID number against the selected standards and warns of any non-conformance issues. If a conflict is found, a warning message is displayed, with the option to continue. Multiplexer also checks for conflicts with other PIDs. If the new PID number conflicts with an existing PID, an error message is displayed and the change is rejected; in this case, either choose a different PID number for the table or edit the number of the PID that is currently the owner.

If no conflict is found, another dialog box is opened to define the scope of the changes:


Apply Section Properties
Apply the PID change to:
OK
Cancel
This section only
All sections of this version
All sections with the same table id and extension
All sections with the same table id

Select the required scope and click on OK. Selecting Cancel will abandon the change.

Version Timing. The Version timing tab shows the time when the version will become current, and the start and end times. New values may be specified for any of these times.



Start Time: Specifies the time at which sections of this version will start to appear in the transport stream.

Signaled As Current Time:
Controls the time when the sections with this version will have the current_next_field set to 1.

By default when these sections start to appear in the transport stream, the current_next_field of the section set to 0. To specify a version that is always current set the Start Time and Signaled As Current Time fields to the same value.

Transmit until end of transport stream:
Enables the section to be repeated until the end of the transport stream. If the checkbox is disabled, the Stop Time becomes active.

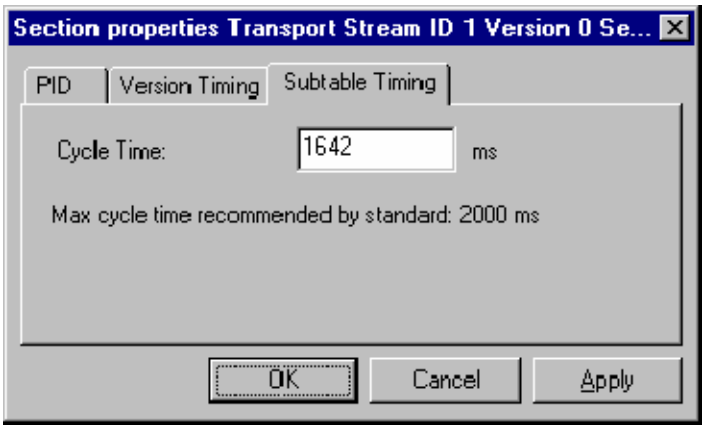
Stop Time: Specifies the time after which no sections of this version will appear in the transport stream.

All of the times are in seconds, taken from the start of the transport stream file.

Edit the values and select OK to change the timings. Edit the values and select Apply to make the changes and update the other properties (tabs) without having to close this dialog box.

Subtable Timing. Service information is usually constrained to appear at regular intervals in the transport stream. This is usually implemented as a maximum time between appearances of all the sections of a subtable (where a table is defined by the table_id, table_id_extension and version_number on the same PID).

Use the Subtable Timing tab to specify the desired and the maximum acceptable period between instances of the subtable. When an MPEG file has been opened, this shows the mean time between instances of the subtable in the transport stream.



Cycle Time: Displays the mean time between instances of the subtable specified for synthesizing a new MPEG file. The value can be edited to specify a different cycle time.

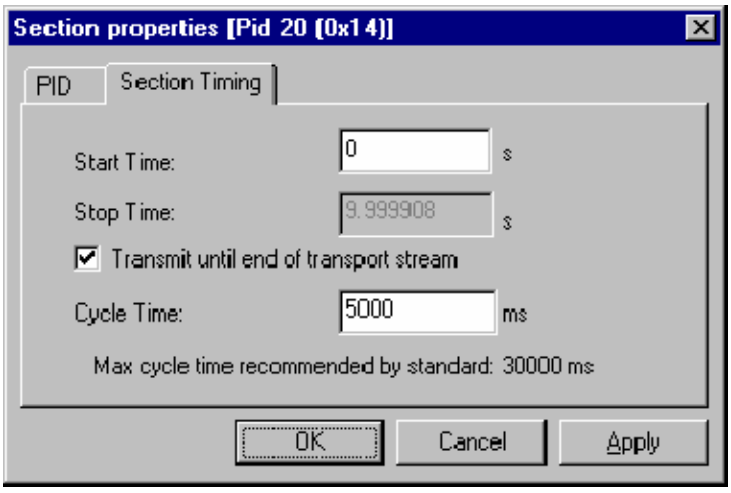
Beneath the Cycle Time, the dialog box displays subtable specific information from the currently selected standard.

Edit the values and select OK to change the Cycle Times. Select Apply to make the changes and update the other properties (tabs) without having to close this dialog box.

When synthesizing a new transport stream, the multiplex engine tries to insert the subtable at the frequency specified by the Cycle Time. An error message is written to the event log whenever a subtable cannot be multiplexed into the stream within the period specified by the maximum cycle time.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

Section Timing. Where a table can contain only a single section (for example, TOT and TDT), a section timing tab is displayed in the Properties dialog box.



Start Time: Specifies the time at which the first appearance of this section will occur.

Stop Time: When enabled, specifies the time at which the last appearance of this section will occur.

Transmit until end... When enabled, specifies that the section should be transmitted until the end of the stream.

Cycle Time: Specifies the interval at which the section should be transmitted.

Max cycle time... Gives the cycle time recommended by the current standard.

Edit the values and select OK to change the timings. Select Apply to make the changes and update the other properties (tabs) without having to close this dialog box.

An error message is written to the event log when a table cannot be multiplexed in accordance with the timings set.

Deleting a Section

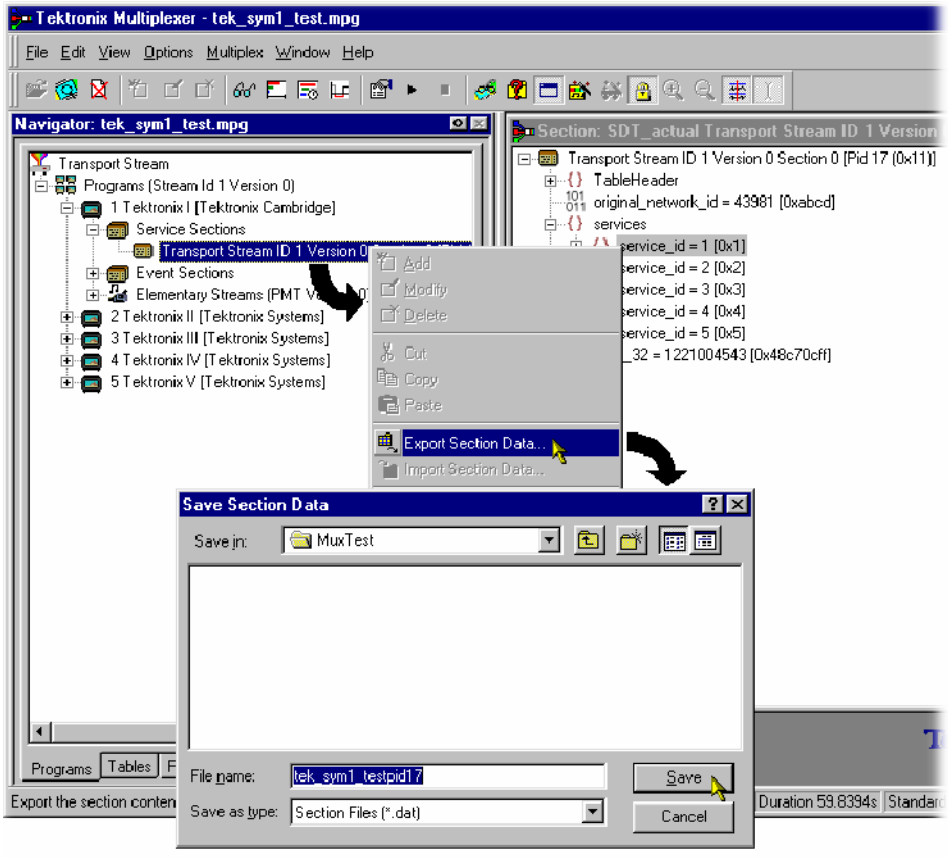
A section can be deleted from a table by highlighting it in the Navigator Tables view and selecting Delete from the right-click menu. To delete more than one section, select and delete each one in turn. When the last section is deleted from a table, the table is automatically deleted from the structure.

Exporting a Section

Section data can be exported in the form of a binary file. In the Navigator Tables view, highlighting a Table node (for example, PMT Tables), allows all sections of the table to be exported. Similarly, highlighting a single section entry (for example, Program 123) allows only that section to be exported.

Highlight the required section or Table node in the Navigator Tables view. From the right-click menu, select Export Section Data. Name the file to be created and choose a location. Select Save to confirm the action.

Individual sections can also be exported using the Navigator Programs view. Highlight the required section to be exported. From the right-click menu, select Export Section Data. Name the file to be created and choose a location. Select Save to confirm the action. Note that not all tables are shown in the Navigator Programs view, for example, TOT.



Importing a Section

In the Navigator Tables view, highlight the PSI/SI Table node. From the right-click menu, select Import Section Data. In the PID tab of the Import Section Data dialog box, identify the PID that is to carry the information. Similarly, in the Source tab, identify the file that holds the section data to be imported. Select OK to confirm the selection. During the import action, the content of the file is examined to determine where the section(s) should be placed

ES PIDs

ES PIDs that carry additional Elementary Streams can be multiplexed into the synthesized transport stream. The following actions are required when defining an elementary stream to be added:

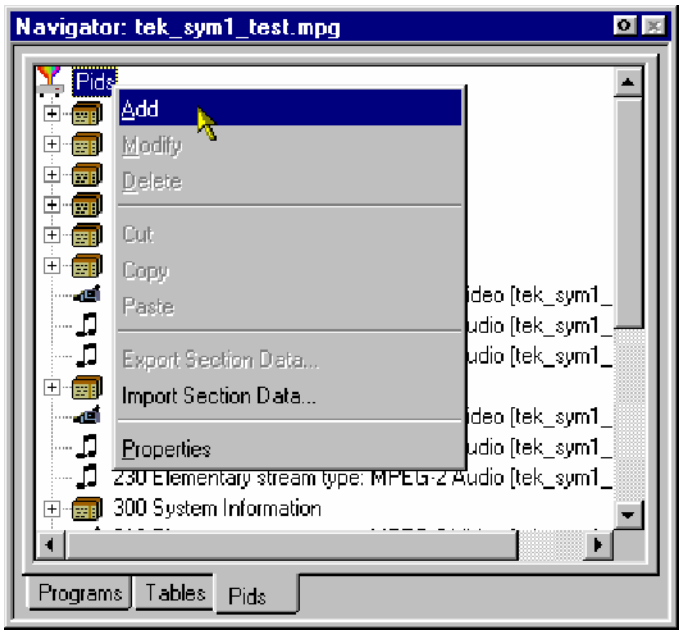
- Allocate a PID number
- Define the source of the elementary stream to be added
- Define the timing to be applied to the new stream
- Define the PCR placement

Adding an Unreferenced Elementary Stream

Methods available:

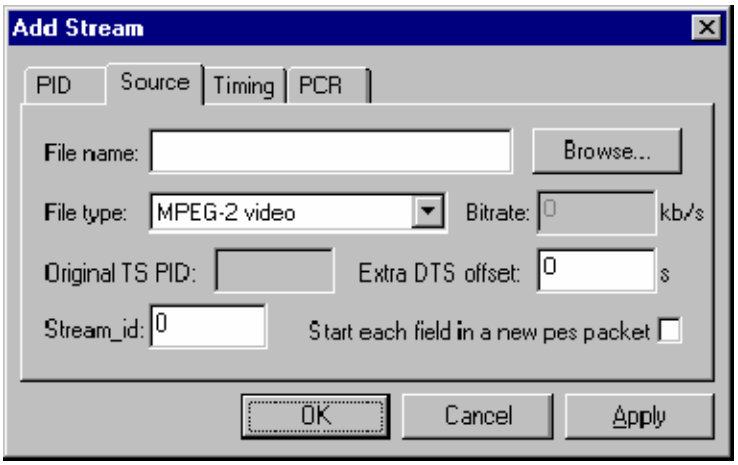
- Highlight the ES PIDs in the Navigator Tables view and select Add from the right-click menu.
- Drag and drop (copy only) from the Examine TS window (Tables view) to the Navigator Tables view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Tables view.

To add a new stream, highlight ES PIDs in the Navigator Tables view and select Add from the right-click menu:



This opens the Add Stream dialog box; the Source tab is displayed by default.

Defining the PID Source. In the Add Stream dialog box, select the Source tab; this allows the PID source to be selected and defined.



File name: Enter the file name of the stream to be multiplexed. If the filename is unknown, select Browse to open a standard file browser dialog and locate the file required.

The names of files being copied to the multiplex will be automatically filled in.

Stream type: Select the type of stream to be multiplexed from the drop-down list box.

The following Stream Types are available:

MPEG-1 video ES or PES
MPEG-2 video ES or PES
MPEG-2 audio ES or PES (MPEG-1 or MPEG-2)
MPEG-2 AAC audio ES or PES (ADTS format only)
AC-3 audio ES or PES
(ES - Elementary Stream;
PES - Packetized Elementary Stream)

Transport Packets A single PID stream. The Bit rate value will require setting. The Original TS PID will require setting.

Section The content of the file will be Sections. The sections will be in binary form. The file will consist of one, or many sections appended one after the other.

When multiplexed, the sections will be encoded on the given PID as SI. If the resulting multiplex is subsequently opened in the Multiplexer, the sections will be interpreted as SI and displayed under the SI Tables node in the tree.

A file generated using the Edit Ò Export Section Data menu option can be used here.

The Bit rate value will require setting.

Other Any binary or ASCII file that is to be packetized into the transport stream at the specified bit rate. The Bit rate value will require setting.

The remaining fields are interactive and will only be enabled when a value is required.

Bitrate: When first defining a source, the bit rate is unknown and 0 Kbps is displayed. If the Transport Packet Stream or an “Other” File Type is selected, the field is enabled and a value (in kbit/s) can be entered.

Original TS PID For streams other than transport streams, this field will be blank and disabled.

Extra DTS offset: When multiplexing ES or PES streams, the Multiplexer will derive an offset between the PCR and the decoded timestamp (DTS) of the first access unit (video picture / audio frame). You can override this offset and make it larger (positive + number) or smaller (negative - number). Changing this value may cause the resultant stream to be non-conformant with respect to the T-STD of the MPEG-2 standard.
Enter the DTS offset in seconds required.

Stream_id Only enabled for elementary stream types. This number specifies the value of the stream_id field in the PES packet header.

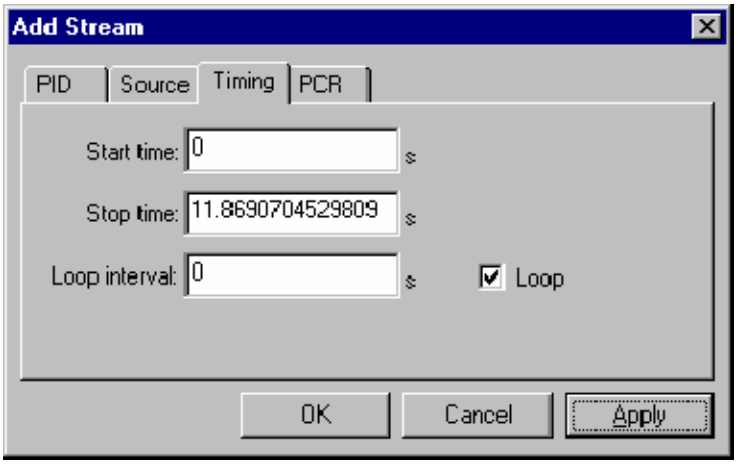
Only needs to be set for DVB stream. Stream identity in the PES header.

Start each field in a new pes packet
(Only enabled when File Type: MPEG-2 Video is selected.)
When disabled, both field pictures making up a coded frame are put in a single PES packet. Otherwise, each field picture is put into a separate PES packet. This setting has no effect upon frame pictures.

Start each section in a new packet

(Only enabled when File Type: Section is selected.)
When disabled, SI data is placed in the packet payloads in the most efficient manner. The start of a section will immediately follow the end of the previous section; no stuffing bytes will be used.
When enabled, each section will begin in a new packet and stuffing bytes will be used to pad out any payloads that are not full.

Defining the Stream Timing. In the Add Stream dialog box, select the Timing tab; this will allow timing parameters for the selected source stream to be defined.

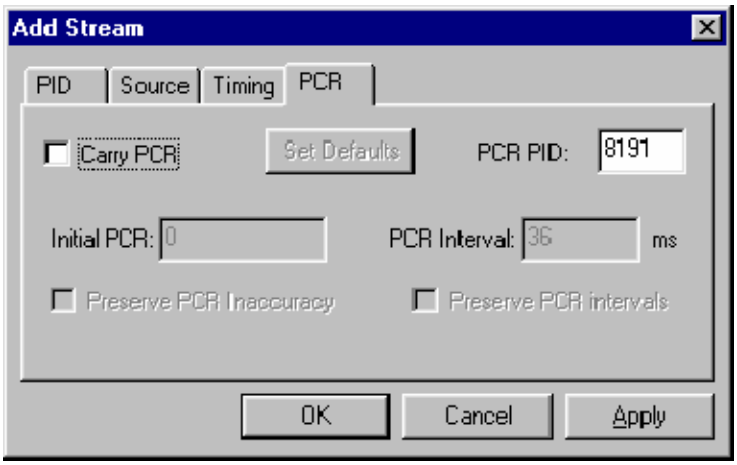


Start/Stop Time: Enter the times that the selected source stream is to start and stop within the host transport stream. Note that the overall duration of the host transport stream is defined through the Transport Stream Properties dialog box.

Loop: Select this checkbox to loop the selected source stream for the duration of the synthesis. A Loop Interval can be set that introduces a delay between each repeat of the source stream; if zero is entered, the source stream will loop continuously. The Loop checkbox will always be disabled for transport stream types. The Multiplexer cannot loop transport streams.

Select OK to accept all changes and close the dialog box.

Defining the PCR Placement. On the Add Stream dialog box select the PCR tab; this will allow PCR placement to be defined.



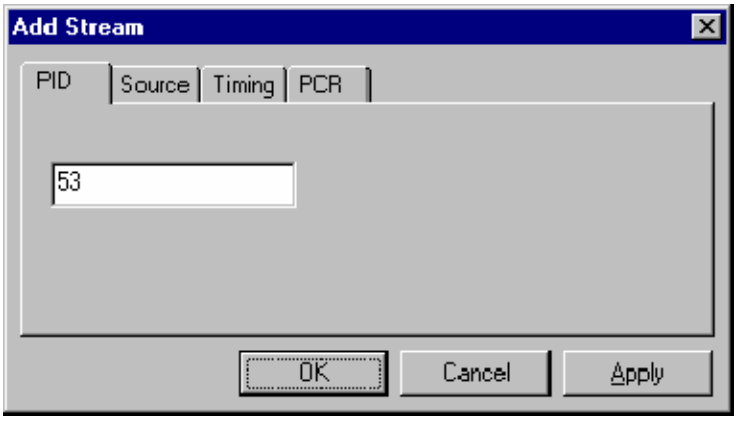
PCR for Elementary Streams. (Includes File Type: Transport Packets.) PCRs are placed in the packets at the specified interval, starting with the specified initial value.

PCR for Remultiplexed PIDs. (Includes File Type: Transport Stream.)

- If the Carry PCR checkbox is not enabled, any PCRs in the packets will be removed.
- If the Carry PCR checkbox is enabled, PCRs will be sent as follows: If Preserve PCR Inaccuracy is set, the PCRs from the original transport stream will be used, otherwise the initial PCR value can be specified.
- If the Preserve PCR Intervals checkbox is enabled, PCRs will be sent in those packets that originally contained them, otherwise PCRs are inserted into packets at the specified intervals.

Specifying the PID Number

Enter the PID number. A new value can be entered using either decimal or hexadecimal notation. Values are assumed to be decimal unless preceded with 0x. The dialog box is not case sensitive and values may include zeros after the prefix and before any significant digits.



When all details (in all tabs) are satisfactory, select OK to accept all changes and close the dialog box.

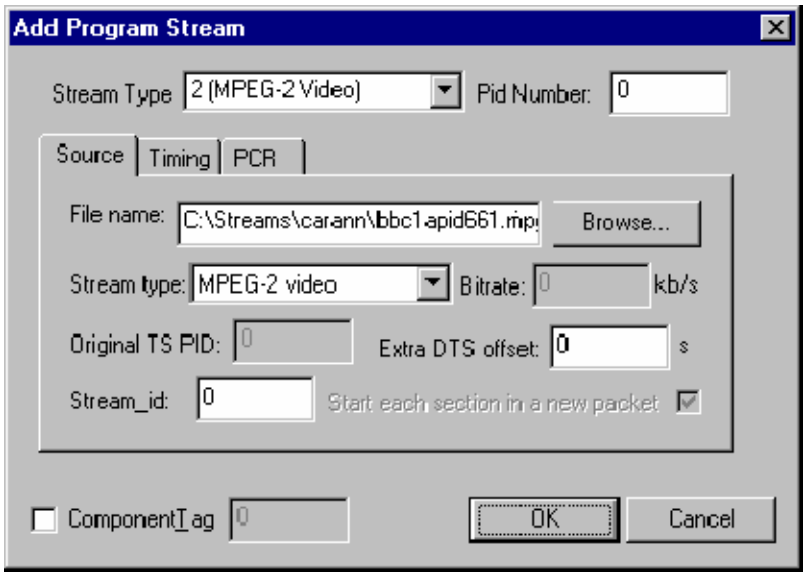
Adding Elementary Streams to the Program Structure

Methods available:

- Highlight an Elementary Stream node in the Navigator Programs view and select Add from the right-click menu.
- Drag and drop (copy only) from the Examine TS window (Programs view) to the Navigator Programs view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Programs view.

Elementary stream data can be added via the Navigator Programs view.

1. In the Navigator Programs view, highlight an Elementary Streams node to which the elementary stream is to be added.
2. From the right-click menu, select Add. The Add Program Stream dialog box is displayed.



The dialog box tabs allows the input elementary stream to be selected and specified. The main dialog box fields Stream Type and Pid Number dictate the PID that will carry the stream and the stream type entry that will be made in the PMT.

3. The functionality of the tabbed dialog boxs is described in the following pages:

Source	See *Defining the PID Source*, page 8-93,
Timing	See *Defining the Stream Timing*, page 8-95,
PCR	See *Defining the PCR Placement*, page 8-96.

4. Enable the Component Tag checkbox, if required. Enter a Component Tag number (0 - 255) in the enabled field. If the Component Tag is enabled, it can be referenced by other tables, for example, Event Information Table.

Exporting Elementary Streams

The Export Elementary Stream option allows the non-packetized elementary stream data to be extracted from an elementary stream and saved to a binary file; note that this data will not include the transport packet or the PES packet headers.

In the Navigator Programs view, highlight the elementary stream whose payload is to be exported. Select the Export Elementary Stream... option from the right-click menu. Name the file to be created and choose a location. Select Save to confirm the action.

Exporting PES Packets

The Export Payload option allows the PES packets to be extracted from an elementary stream and saved to a binary file; note that this data will not include the transport packet headers.

In the Navigator Programs view, highlight the elementary stream whose payload is to be exported. Select the Export Payload option from the right-click menu. Name the file to be created and choose a location. Select Save to confirm the action.

Modifying PES PID Details

To modify any of the ES PID parameters, highlight the required PID in the Navigator Tables view and select Properties from the right-click menu. The Stream Properties dialog box and its tabs are identical to the Add Stream dialog box - refer to *Adding an Unreferenced Elementary Stream*, page 8–92. Locate the parameter to be amended and when changed, select the OK button.

ES PID parameters can also be modified in the Navigator Programs view. Highlight an Elementary Stream in the Programs view and select Properties from the right-click menu. The dialog box thus displayed (Program Stream Properties) is similar to the Add Program Stream dialog box shown on page 8–97.

Deleting a PES PID

An elementary stream can be removed from the multiplex by deleting the PID. To delete a PID, highlight the required PID and select Delete from the right-click menu. Then select the Delete option from the Edit or Pop-Up menus. Alternatively, click the delete button from the toolbar.

Multiplexer asks for confirmation before removing the PID from the multiplex. Select Yes to delete the stream or No to abandon the operation and leave the stream unchanged.

DSM-CC

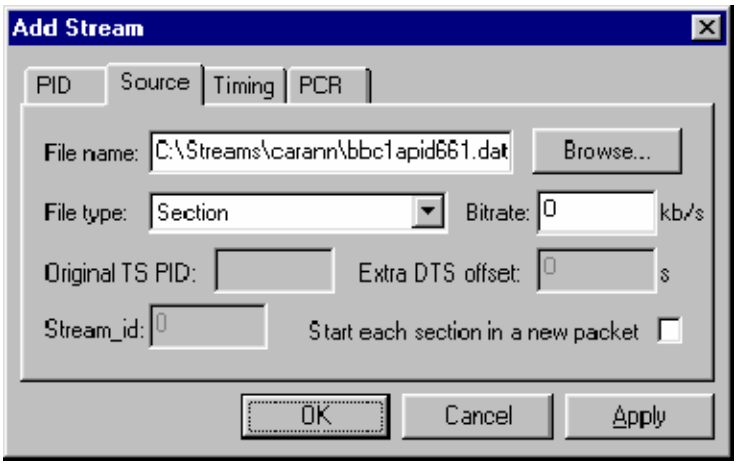
Adding an Unreferenced DSM-CC Section

Methods available:

- Highlight the ES PIDs node in the Navigator Tables view and select Add from the right-click menu.
- Drag and drop (copy only) from the Examine TS window (Tables view) to the Navigator Tables view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Tables view.

Adding an unreferenced DSM-CC section is similar to adding an unreferenced elementary stream (see page 8-92), with the following modifications:

In the Source tab of the Add Stream dialog box, select Transport Packets / Sections as the File type and set the bit rate.



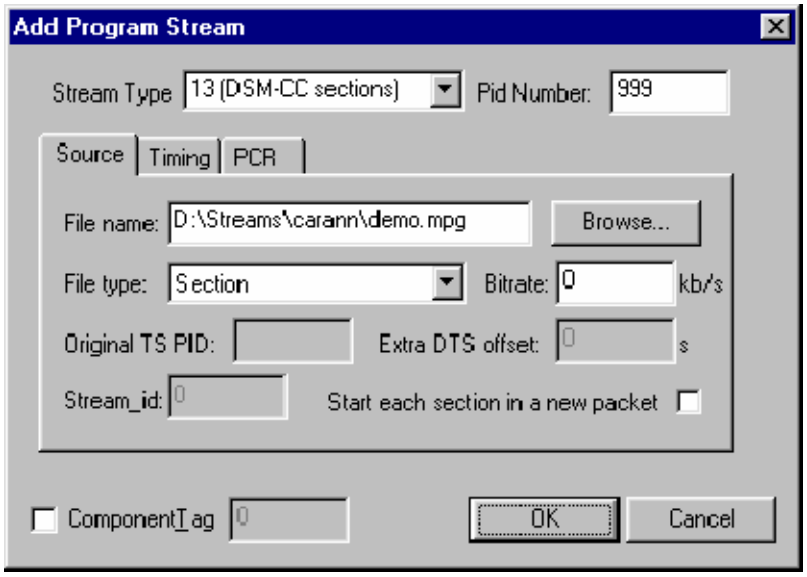
Adding DSM-CC Sections to the Program Structure

Methods available:

- Highlight an Elementary Stream in the Navigator Programs view and select Add from the right-click menu.
- Drag and drop (copy only) from the Examine TS window (Programs view) to the Navigator Programs view.
- Drag and drop (copy/move) from another instance of Multiplexer to the Navigator Programs view.

Adding a DSM-CC section to the program structure is similar to adding an elementary stream to the program structure (see page 8–92), with the following modifications:

The main dialog box fields Stream Type and Pid Number dictate the PID that will carry the stream and the stream type entry that will be made in the PMT. The Stream Type should be set to one of the DSM-CC entries.



In the Source tab of the Add Program Stream dialog box, identify the File name to be added. Select Transport Packets / Sections as the Stream type and set the bit rate.

The DSM-CC section will be added.

Delete a DSM-CC Section

A DSM-CC section can be deleted from a table by highlighting it in the Navigator view and selecting Delete from the right-click menu. To delete more than one section, select and delete each one in turn.

Export a DSM-CC Section

DSM-CC data can be exported in the form of a binary file.

Highlight the required DSM-CC section in the Navigator Tables view. From the right-click menu, select Export Section Data. Name the file to be created and choose a location. Select Save to confirm the action.

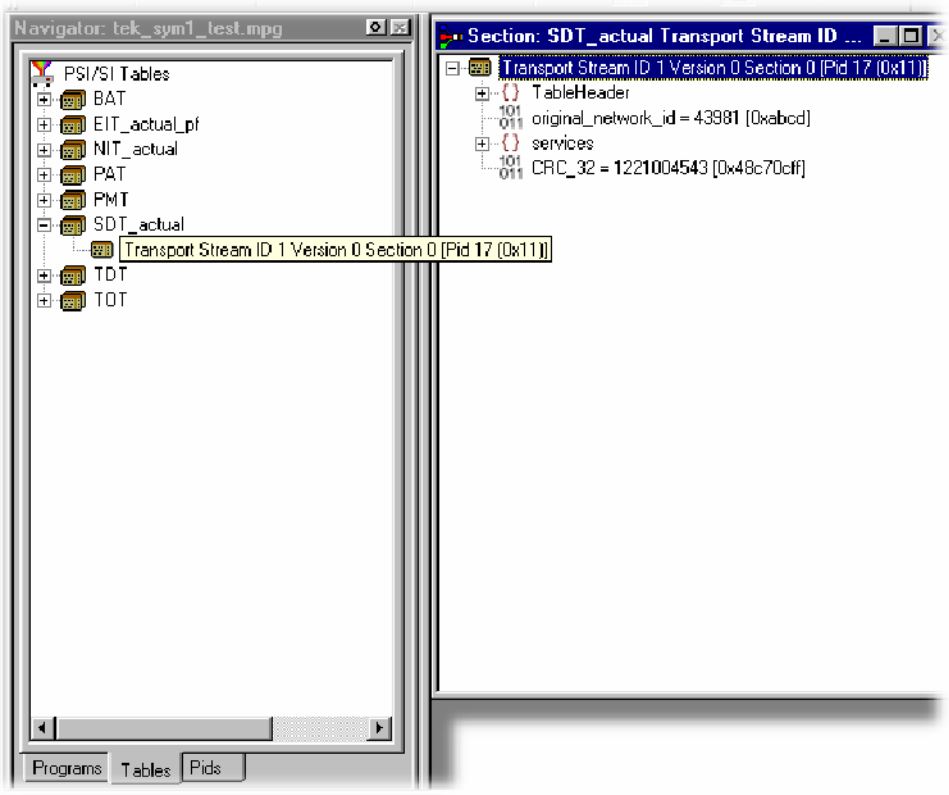
Individual DSM-CC sections can also be exported using the Navigator Programs view. Under any Elementary Streams node, highlight the DSM-CC section to be exported. From the right-click menu, select Export Section Data.... Name the file to be created and choose a location. Select Save to confirm the action.

Editing in Section View

Use the Section View window to modify the contents of a version/section. This includes version, section, and table-specific data that the Navigator Tables view displays. If the Section View window it is not already open, highlight the Section View option from the View menu.

If a section/version is selected in the Navigator Tables view, the contents are automatically displayed in the Section View; otherwise the Section View window is blank.

To open a table version/section in Section View, select the component in the Navigator Tables view. The Section View is updated immediately to show the selected section/version.



Editing Fields

To add, change, or delete a field, element or loop in a section/version, the parent table must be selected in the Navigator Tables view. Highlight the appropriate line in the Section view and select the required option from the right-click menu.

Selecting a Field

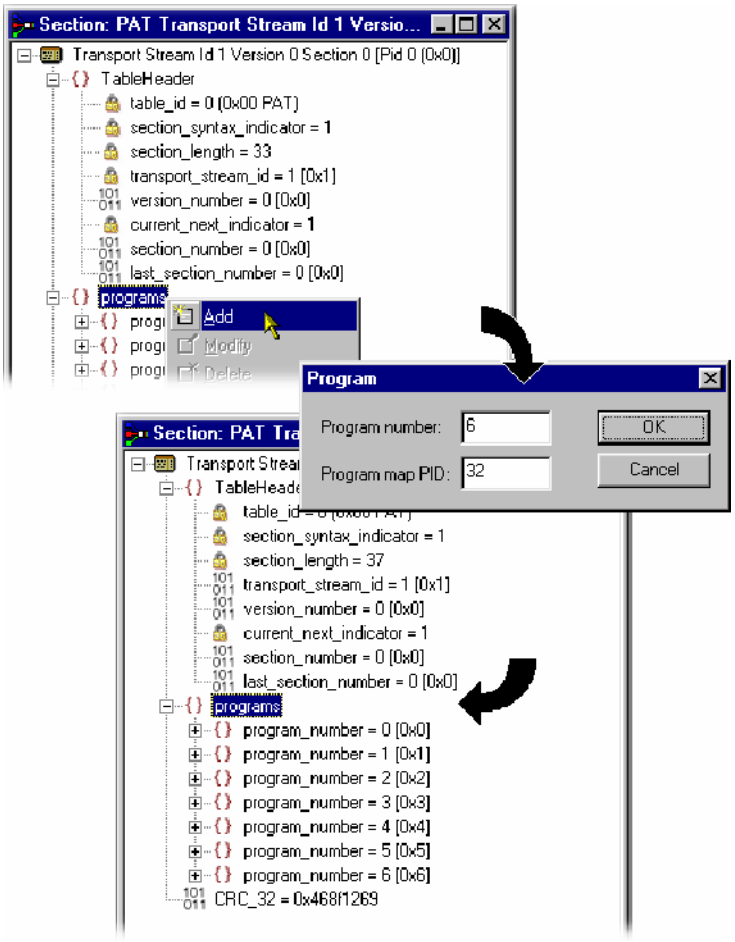
To select a field or container, place the mouse pointer over it and click the left button.

The magnifying glass icon, indicates the selected component.

If Standard Mode is selected, the magnifying glass selection cannot be placed on a field that is locked. To select and edit locked fields, first select the Expert Mode option from the Multiplex menu.

Adding an Element to Loop

To add an element to a loop, select the parent loop that will contain it, and then select Add from the right-click menu. For example, to add a program to a PAT, highlight the Programs container and select Add from the right-click menu:



In this example, a dialog box is displayed in which the Program Number and Program Map PID can be accepted or respecified. Other table loops may not display any dialog box, but immediately create a new element with default contents. An entry is displayed for the new element, with its details collapsed, at the end of the list of elements in the loop. In addition, the section length field is automatically recalculated and amended. For the example above of adding an element to the Programs loop in a PAT, the new entry is program_number = 6 (0x6).

***NOTE**. The example above was taken with Standard mode selected. In Standard mode, all recalculation is done automatically. In Expert mode, a program element will be added, but the program number and PID must be manually adjusted. Similarly, the section length will need to be calculated and amended manually (see also Expert and Standard Modes, page 8–54).*

Deleting an Element in a Loop

To delete a loop element, in the Section view, highlight the element and select Delete from the right-click menu.

The element is deleted and the Section View window updated to reflect the changes.

Modifying the Contents of a Field

To edit the contents of a field, highlight the field and select Modify from the right-click menu. This will open an appropriate dialog box for modifying the type of data held by the field.

The following paragraphs describe the different types of data that may be modified.

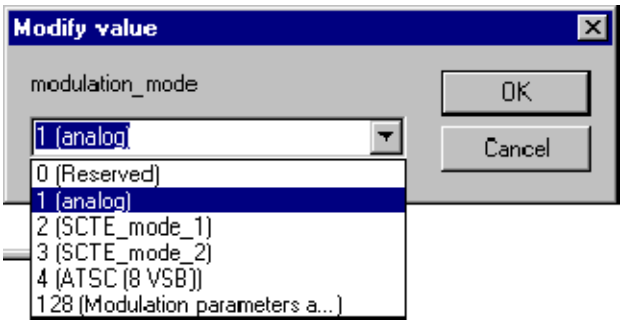
Enumerated Value. The Modify value dialog box displays the name of the field and the current value. The value is shown as a number followed by the interpretation of the governing standards.

In this screenshot the field being edited is a modulation_mode and the current text is 1 (analog).

Type in the number, without any text, for the required value. When the changes are accepted, Multiplexer will display the interpretation in the Section View window.

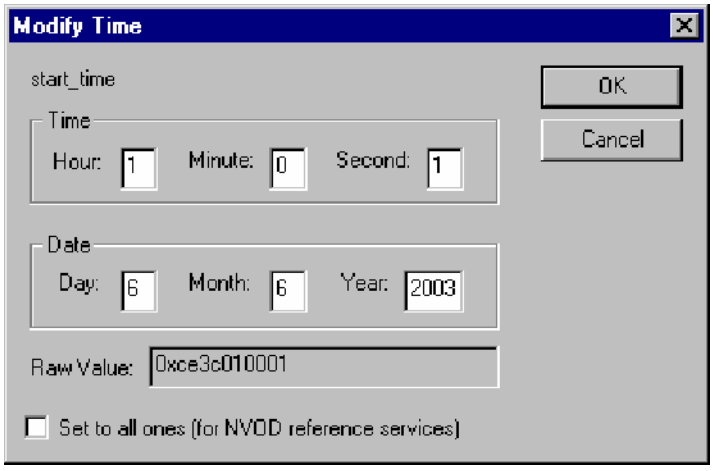
Alternatively, click the down arrow to select the value from the drop down list.

This displays a list of the defined values and their interpretation. The list will vary depending upon the field being edited.



Enter the required value and select OK to continue. Multiplexer may open a simple context-sensitive dialog box offering advice and/or asking for more information or confirmation. An error message is displayed if the number that was typed in requires more bits than are allocated to the field.

Date & Time. The Modify Time dialog box displays the name of the field. It displays the time in both interpreted and raw formats; only the interpreted mode can be edited.

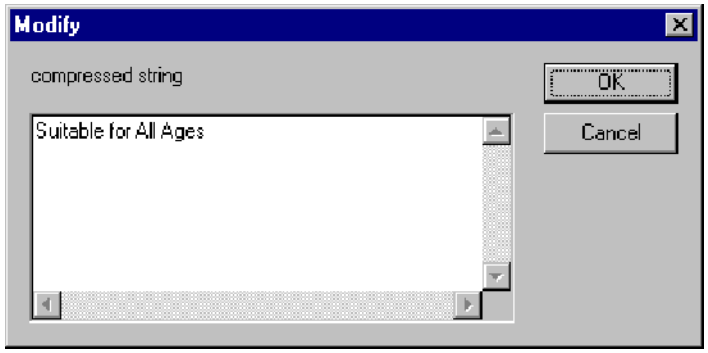


Edit the numbers in any of the fields as required. All fields are updated as each digit is added, changed or deleted. Select OK to commit the changes or Cancel to abandon editing and keep the original time.

The Set to all ones checkbox, when enabled, sets the 40 bit date field to 0xFFFFFFFFF. This may be required when setting the start_date for an event in a Near Video on Demand (NVOD) reference service.

Compressed String

The Modify dialog box displays the name of the field, which is always a compressed string, and the contents of the selected string segment. Text can be entered, deleted, selected, copied to and pasted from the windows clipboard.



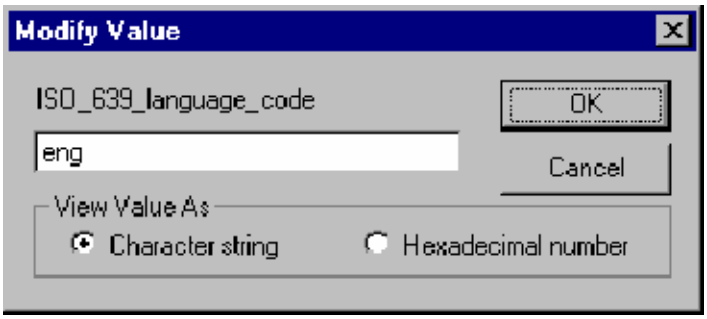
Edit the text and select OK to continue. Select Cancel to abandon the edits and leave the original segment unchanged. Multiplexer will check that the new string length will not make the total section length exceed the maximum specified by the standards.

If it does, an error message will be displayed:

Select OK to return to the Modify dialog box and shorten the string.

Text. The Modify Text dialog box displays the name of the field and the current text on a single line. Text can be entered, deleted, copied to and pasted from the windows clipboard.

In this screenshot, the field being edited is an ISO_639_language_code and the current text is eng.



View Value As — You can choose between viewing the text as an ASCII character string or a hexadecimal sequence.

Most text strings have a maximum length, specified by the governing standards, which this dialog box will enforce. Edit the text and select OK to continue. Select Cancel to abandon the edits and leave the original text unchanged.

Numeric. The Modify dialog box displays the name of the field and the current value in decimal. Edit the existing value or type in a new value.

In this screenshot, the field being edited is a version_number and the current value is 0xc.

A new value can be entered using either decimal or hexadecimal notation. Values are assumed to be decimal unless preceded by 0x. The dialog box is not case

sensitive and values may include zeros after the prefix and before any significant digits, for example:

Edit or replace the existing value and then select OK to continue. Select Cancel to abandon any changes made in the field.

Multiplexer will check the new value against the governing standards and for conflicts with other fields. It may open a simple context-sensitive dialog box offering advice and/or asking for more information or confirmation. For example: when changing a version_number, a dialog box is opened to determine the scope of the change.

Multiplexing Transport Streams

The Multiplex Engine in the Multiplexer synthesizes a new transport stream and writes it to an MPEG file. The contents of the new stream are multiplexed according to the specification currently held in memory, which is shown in the Navigator and Section views.

The tables that are displayed in the Navigator are synthesized from the current specification. Elementary streams and other data are acquired from the original MPEG file and other stream files and remultiplexed according to the specification.

Start

To start the Multiplex Engine, select the Start option from the Multiplex menu. Alternatively, select the start button on the Toolbar.

Multiplexer opens a standard file-browser dialog box to specify the file name and path for the synthesized transport stream.

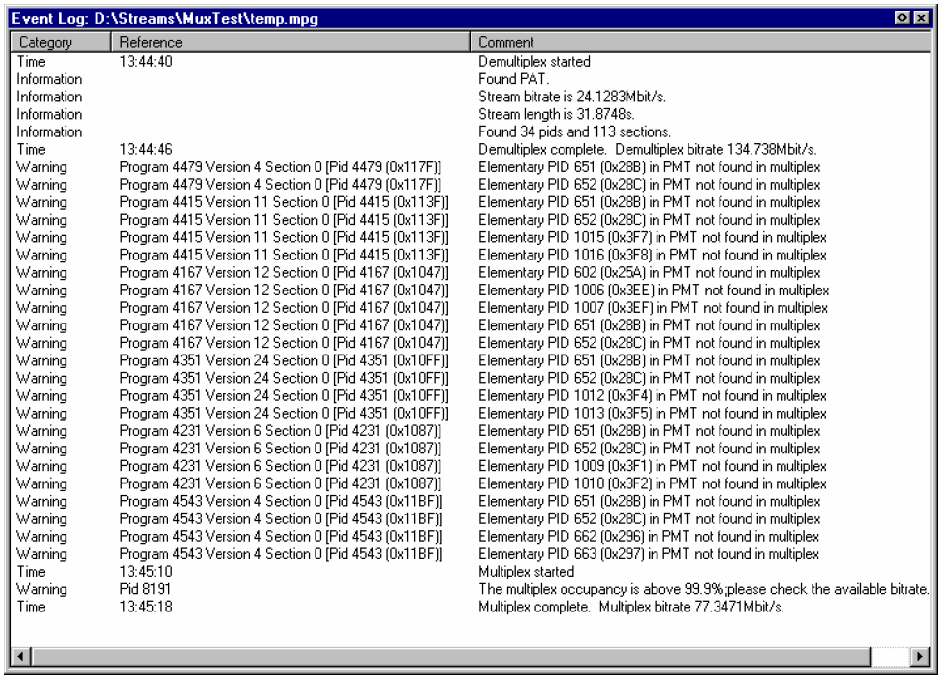
A new file can be created or an existing file can be selected to be overwritten. The program will seek confirmation before writing over an existing file.

***NOTE**. The Multiplexer automatically creates 188 byte packets in the transport stream output file, regardless of the source material size.*

Errors and Reporting

The right pane of the status bar indicates progress as the Multiplex Engine synthesizes the new transport stream.

Any errors are recorded in the Event Log, which can be opened at any time before, after and during processing. Here is an example where a table cannot be multiplexed into the new stream at the specified rate:


Event Log: D:\Streams\MuxTest\temp.mpg
Category | Reference | Comment
Time | 13:44:40 | Demultiplex started
Information | | Found PAT.
Information | | Stream bitrate is 24.1283Mbit/s.
Information | | Stream length is 31.8748s.
Information | | Found 34 pids and 113 sections.
Time | 13:44:46 | Demultiplex complete. Demultiplex bitrate 134.738Mbit/s.
Warning | Program 4479 Version 4 Section 0 [Pid 4479 (0x117F)] | Elementary PID 651 (0x28B) in PMT not found in multiplex
Warning | Program 4479 Version 4 Section 0 [Pid 4479 (0x117F)] | Elementary PID 652 (0x28C) in PMT not found in multiplex
Warning | Program 4415 Version 11 Section 0 [Pid 4415 (0x113F)] | Elementary PID 651 (0x28B) in PMT not found in multiplex
Warning | Program 4415 Version 11 Section 0 [Pid 4415 (0x113F)] | Elementary PID 652 (0x28C) in PMT not found in multiplex
Warning | Program 4415 Version 11 Section 0 [Pid 4415 (0x113F)] | Elementary PID 1015 (0x3F7) in PMT not found in multiplex
Warning | Program 4415 Version 11 Section 0 [Pid 4415 (0x113F)] | Elementary PID 1016 (0x3F8) in PMT not found in multiplex
Warning | Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)] | Elementary PID 602 (0x25A) in PMT not found in multiplex
Warning | Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)] | Elementary PID 1006 (0x3EE) in PMT not found in multiplex
Warning | Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)] | Elementary PID 1007 (0x3EF) in PMT not found in multiplex
Warning | Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)] | Elementary PID 651 (0x28B) in PMT not found in multiplex
Warning | Program 4167 Version 12 Section 0 [Pid 4167 (0x1047)] | Elementary PID 652 (0x28C) in PMT not found in multiplex
Warning | Program 4351 Version 24 Section 0 [Pid 4351 (0x10FF)] | Elementary PID 651 (0x28B) in PMT not found in multiplex
Warning | Program 4351 Version 24 Section 0 [Pid 4351 (0x10FF)] | Elementary PID 652 (0x28C) in PMT not found in multiplex
Warning | Program 4351 Version 24 Section 0 [Pid 4351 (0x10FF)] | Elementary PID 1012 (0x3F4) in PMT not found in multiplex
Warning | Program 4351 Version 24 Section 0 [Pid 4351 (0x10FF)] | Elementary PID 1013 (0x3F5) in PMT not found in multiplex
Warning | Program 4231 Version 6 Section 0 [Pid 4231 (0x1087)] | Elementary PID 651 (0x28B) in PMT not found in multiplex
Warning | Program 4231 Version 6 Section 0 [Pid 4231 (0x1087)] | Elementary PID 652 (0x28C) in PMT not found in multiplex
Warning | Program 4231 Version 6 Section 0 [Pid 4231 (0x1087)] | Elementary PID 1009 (0x3F1) in PMT not found in multiplex
Warning | Program 4231 Version 6 Section 0 [Pid 4231 (0x1087)] | Elementary PID 1010 (0x3F2) in PMT not found in multiplex
Warning | Program 4543 Version 4 Section 0 [Pid 4543 (0x11BF)] | Elementary PID 651 (0x28B) in PMT not found in multiplex
Warning | Program 4543 Version 4 Section 0 [Pid 4543 (0x11BF)] | Elementary PID 652 (0x28C) in PMT not found in multiplex
Warning | Program 4543 Version 4 Section 0 [Pid 4543 (0x11BF)] | Elementary PID 662 (0x296) in PMT not found in multiplex
Warning | Program 4543 Version 4 Section 0 [Pid 4543 (0x11BF)] | Elementary PID 663 (0x297) in PMT not found in multiplex
Time | 13:45:10 | Multiplex started
Warning | Pid 8191 | The multiplex occupancy is above 99.9%;please check the available bitrate.
Time | 13:45:18 | Multiplex complete. Multiplex bitrate 77.3471Mbit/s.

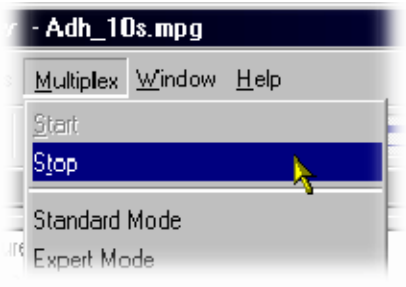
Each table has a specification for nominal and maximum interval, in milliseconds, between instances of the table. These can be edited using the Navigator. The multiplex engine will try to multiplex the table into the synthesized transport stream at the nominal repetition rate. Errors are reported whenever packets for any PID cannot be encoded at their specified minimum rate.

The complete text may be copied onto the windows clipboard, using the Copy option from the right-click menu. The text can also be cleared with the Clear command. Both commands are also available from the Edit menu.

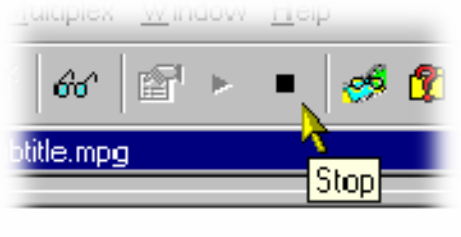
Stop

The Multiplex Engine can be stopped at any time while it is running. This will abandon processing and close the file. The file will contain all of the packets synthesized up to the time the engine was stopped.

To stop the Multiplex Engine, select the Stop option from the Multiplex menu.



Alternatively, select the stop button on the Toolbar:

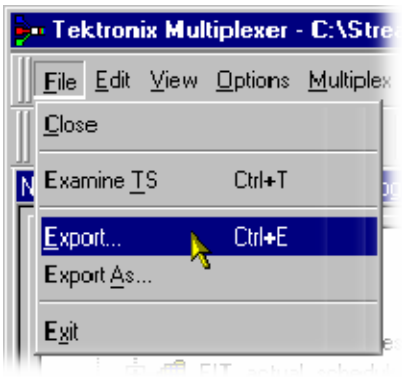


Exporting the Multiplex Configuration File

***NOTE**. Multiplexer is used for generating both conformant and non-conformant streams. Use the Export and Export As options to save copies of the specification for non conformant streams in a multiplex configuration file. This file does not include a copy of the transport stream, instead, it refers to the original MPEG file by name and location.*

The multiplex configuration file can be reopened using the Import option (see page 8–11).

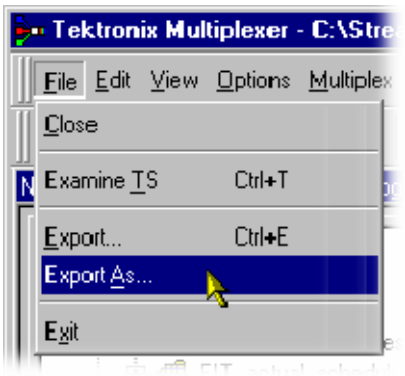
Export Select the Export option from the File menu to save any changes to the current multiplex configuration file. Alternatively, use the Ctrl+E keyboard shortcut.



If a multiplex configuration file has not been opened, Export opens a standard file browser dialog box to specify the file. This is the same as selecting the Export As... option.

Export As

The Export As option from the File menu exports a file with a user-specified name.



Multiplexer opens a standard file browser dialog box to select an existing file or specify a new file.

If creating a new file, specify the name of the exported file and select where it will be saved. By default, files are be created with .muxml as the file extension.

Make Seamless

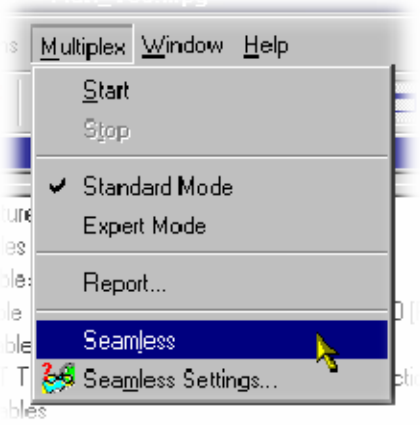
When you loop a transport stream to simulate continuous playout, errors can be generated at the loop point caused by discontinuities in timing information. The Seamless option provides the opportunity of creating seamless MPEG-2 files.

The option can be set up and enabled so that all multiplex operations result in seamless output - or none.

Enabling the Seamless option

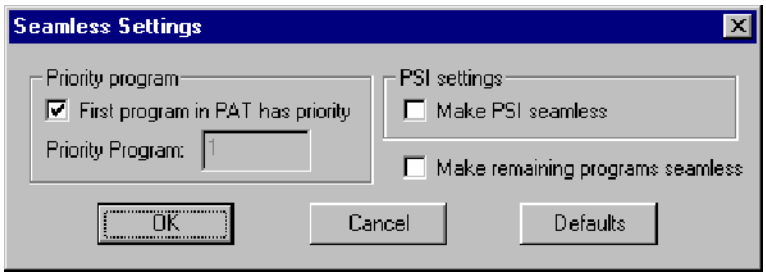
Toggle the Seamless option by selecting Multiplex > Seamless

or the toolbar button



Seamless Settings

Open the Seamless Settings dialog box by selecting Multiplex > Seamless Settings.... The dialog box shown below is displayed:



Priority Program

First program in PAT has priority

If this setting is enabled, the first program specified in the PAT will be given priority in the make seamless process.

If the setting is disabled, the priority program can be specified in the Priority Program. The number can be deduced by inspecting the results of the transport stream analysis.

PSI Settings

Make PSI seamless — If enabled, the service information contained in the transport stream is processed to make it seamless.

If the setting is disabled, the PSI/SI is not processed but simply copied to the output transport stream.

Make remaining programs seamless

If enabled, the remaining programs are made seamless but are constrained by limits defined by the priority program. This may lead to these remaining programs having a gap at the beginning and end of the file.

Reference

Abbreviations

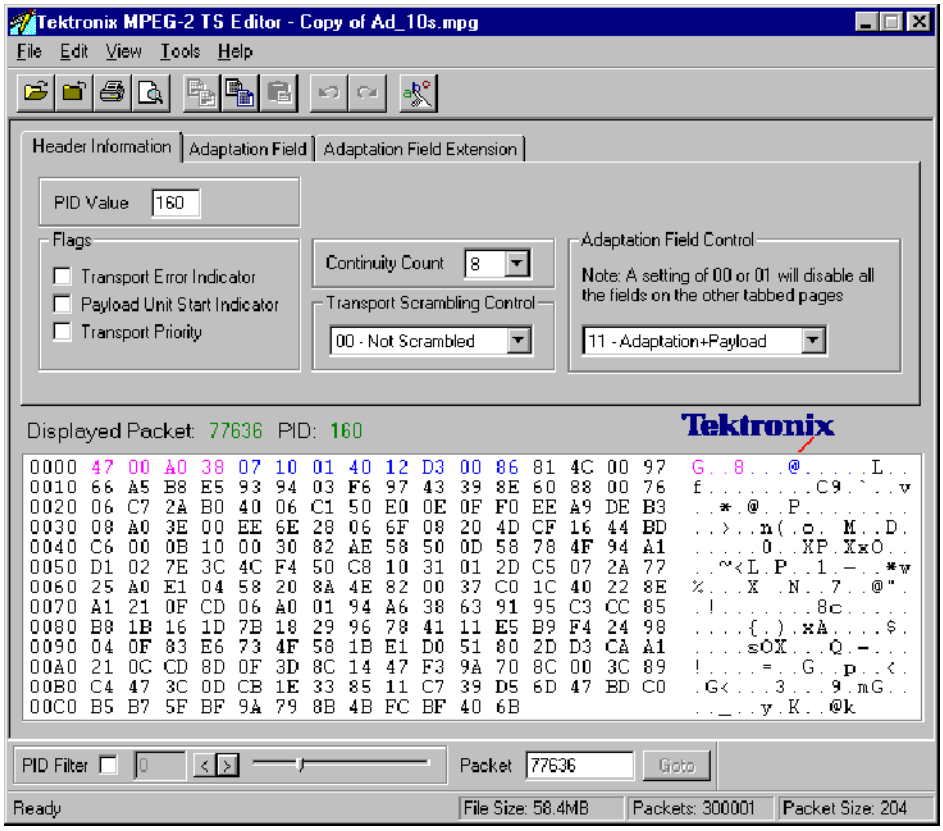
AIT	Application Information Table
ASCII	American Standard Code for Information Interchange
ATSC	Advanced Television Systems Committee
CAT	Conditional Access Table (MPEG
CDT	Carrier Definition Table
CVCT	Cable Virtual Channel Table (ATSC)
DSM-CC	Digital Storage Media - Command and Control
EIT	Event Information Table (DVB/ATSC)
ES	Elementary Stream
ETT	Extended Text Table (ATSC)
MGT	Master Guide Table (ATSC)
MMT	Modulation Mode Table
NIT	Network Information Table (DVB)
PAT	Program Association Table (MPEG)
PES	Packetized Elementary Stream
PID	Packet IDentifier
PIT	Program Information Table (ATSC)
PMT	Program Map Table (MPEG)
PSI	Program Specific Information (MPEG)
PSIP	Program and System Information Protocol (ATSC)
RAID	Redundant Array of Independent Disks
RRT	Regional Ratings Table (ATSC)
RST	Running Status Table (DVB)
SDT	Service Description Table (DVB)
SI	Service Information (DVB)
SIT	Satellite Information Table
STT	System Time Table (ATSC)
TDT	Transponder Data Table (ATSC)

TNT	Transponder Name Table
TOT	Time Offset Table (DVB)
TS	Transport Stream
TSTD	Transport Streams Description Table
T-STD	Transport Stream System Target Decoder
TVCT	Terrestrial Virtual Channel Table (ATSC)
UTC	Universal Coordinated Time
VCT	Virtual Channel Table (ATSC)
XML	Extensible Markup Language

Transport Stream Editor

Getting Started

The Transport Stream Editor can be used to edit the contents of transport stream packets contained in a file. It displays the complete contents of each packet in hexadecimal and provides an interpreted view of the packet header information.


Tektronix MPEG-2 TS Editor - Copy of Ad_10s.mpg
File Edit View Tools Help
Header Information
Adaptation Field
Adaptation Field Extension
PID Value 160
Flags
Transport Error Indicator
Payload Unit Start Indicator
Transport Priority
Continuity Count 8
Transport Scrambling Control
00 - Not Scrambled
Adaptation Field Control
Note: A setting of 00 or 01 will disable all the fields on the other tabbed pages
11 - Adaptation+Payload
Displayed Packet: 77636 PID: 160
Tektronix
0000 47 00 A0 38 07 10 01 40 12 D3 00 86 81 4C 00 97
0010 66 A5 B8 E5 93 94 03 F6 97 43 39 8E 60 88 00 76
0020 06 C7 2A B0 40 06 C1 50 E0 0E 0F F0 EE A9 DE B3
0030 08 A0 3E 00 EE 6E 28 06 6F 08 20 4D CF 16 44 BD
0040 C6 00 0B 10 00 30 82 AE 58 50 0D 58 78 4F 94 A1
0050 D1 02 7E 3C 4C F4 50 C8 10 31 01 2D C5 07 2A 77
0060 25 A0 E1 04 58 20 8A 4E 82 00 37 C0 1C 40 22 8E
0070 A1 21 0F CD 06 A0 01 94 A6 38 63 91 95 C3 CC 85
0080 B8 1B 16 1D 7B 18 29 96 78 41 11 E5 B9 F4 24 98
0090 04 0F 83 E6 73 4F 58 1B E1 D0 51 80 2D D3 CA A1
00A0 21 0C CD 8D 0F 3D 8C 14 47 F3 9A 70 8C 00 3C 89
00B0 C4 47 3C 0D CB 1E 33 85 11 C7 39 D5 6D 47 BD C0
00C0 B5 B7 5F BF 9A 79 8B 4B FC BF 40 6B
PID Filter
Packet 77636
Goto
Ready
File Size: 58.4MB
Packets: 300001
Packet Size: 204

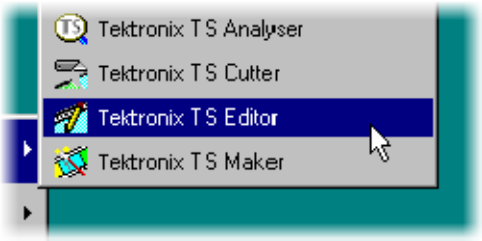
Packet headers can be edited from both the header interpretation and hexadecimal displays. These are referred to as the Header Editor and the Hex Editor, respectively. All changes made in one view are immediately shown in the other. The Header Editor is context sensitive, only allowing edits that make sense with the other fields in the header. It gives full syntax checking of all changes that are made. The payload and any Reed Solomon data are edited from the Hexadecimal Editor.

On the right of the Hex Editor pane, the ASCII character is displayed. Unprintable characters are shown as a period (dot or full stop).

It is normal to edit a copy of a transport stream. Transport Stream Analyzer can be used to view the original while editing the copy.

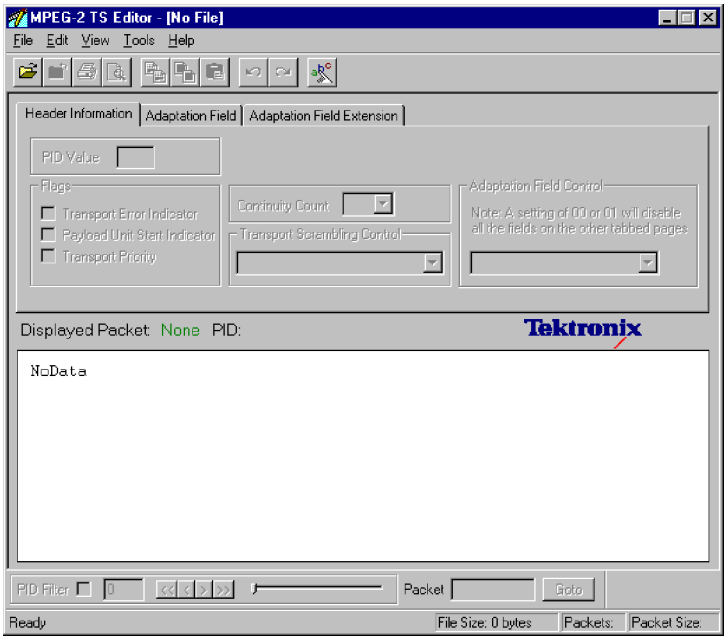
Starting the Program

The program may be started by selecting the TS Editor option from the Start > Programs menu or by double-clicking on the TS Editor shortcut on the desktop.



Initial Appearance

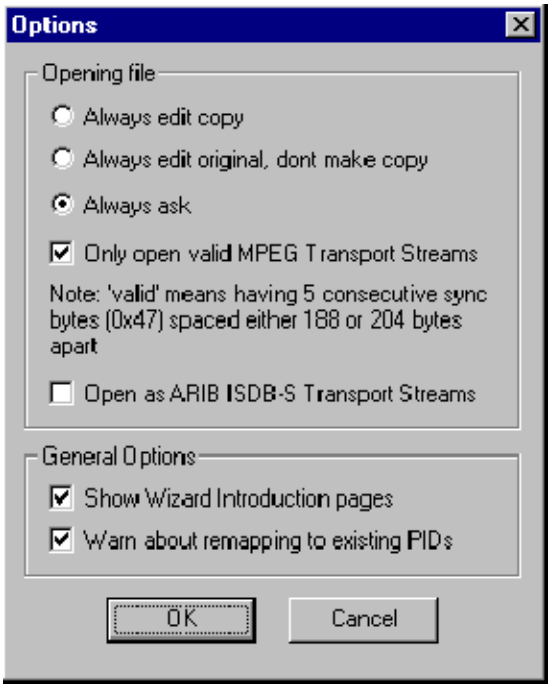
Once the program has started and is ready for use, it will open a Main Window that looks like this:



Options

The Transport Stream Editor has a set of options relating to general use and opening files. It is a good idea to review the options before opening a file.

The settings can be changed at any time by selecting Options... from the Edit menu. This opens the Options dialogue box.


Options
Opening file
Always edit copy
Always edit original, dont make copy
Always ask
Only open valid MPEG Transport Streams
Note: 'valid' means having 5 consecutive sync bytes (0x47) spaced either 188 or 204 bytes apart
Open as ARIB ISDB-S Transport Streams
General Options
Show Wizard Introduction pages
Warn about remapping to existing PIDs
OK
Cancel

Opening File

Specifies how the program will interpret the packet size of the stream. The options are mutually exclusive and are as follows:

- Always edit copy
  When opening a file Editor always makes a copy, without asking.
- Always edit original, don't make copy
  Uses the original files without making a copy or asking for confirmation.
- Always ask
  Before opening a file for editing, asks if it should edit the original or make a copy.
- Only open valid MPEG Transport Stream files
  Will open files that have five or more consecutive sync bytes.
- Open as ARIB ISDB-S Transport Streams
  Opens transport streams encoded as ARIB ISDB-S format (including TMCC information).

General Options

☑ Show Wizard Introduction pages
Causes any wizards invoked by Editor to display their Introduction pages.

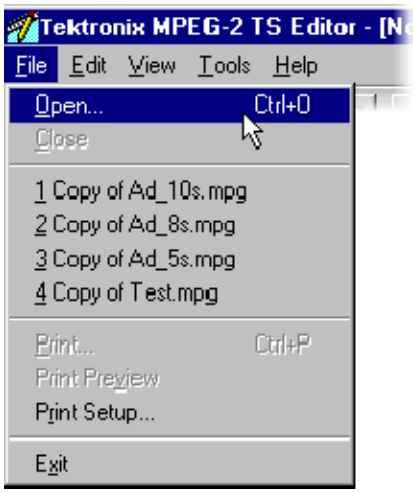
☑ Warn about remapping to existing PIDs
Warns if an operation will remap a PID onto one that is already in use.

Opening a File

Any stream that is held in a file can be edited with the Transport Stream Editor.

Opening a File from the Menus and Toolbar

To edit a file, select the Open ... option from the File menu. If the required file is in the list of recently edited files, it may be selected from the list to save using the Open file dialog box.



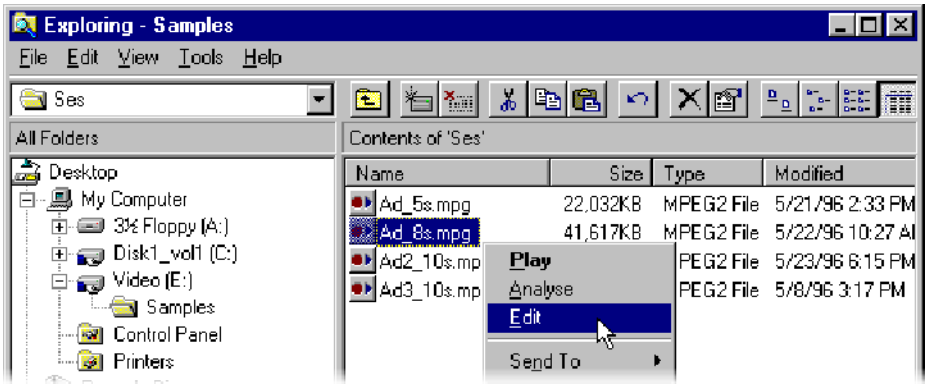
Alternatively, use the Ctrl+O keyboard shortcut.

There is also a shortcut button available on the Toolbar for opening a file, which has the standard file open symbol:

Opening a File from Windows Explorer or a File Browser Window

The program can be started and a file opened (with the last set of program options) in a single operation from Windows Explorer or a File Browser Window.

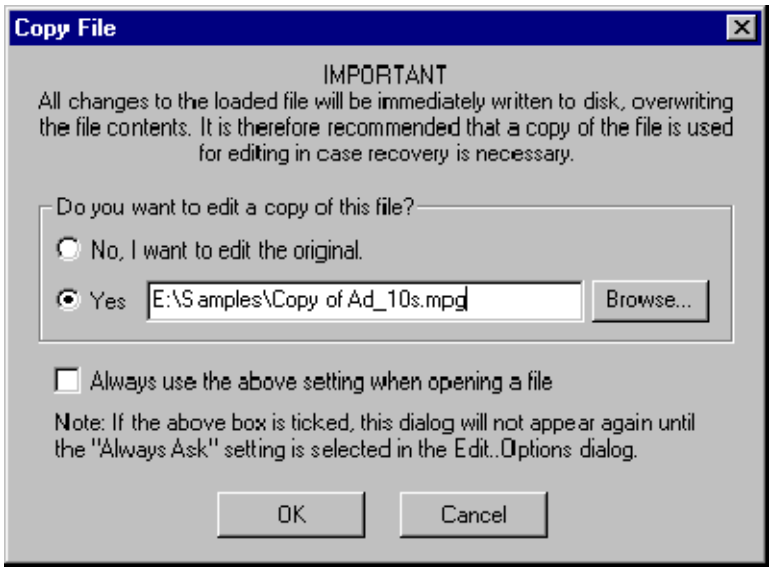
Place the pointer over the file name or icon, press the right mouse button to open a menu, and then select the Edit option.



Copying File before Editing

TS Editor writes all edits to the file immediately. To avoid accidental changes to prime data, the application can make a copy of the file and edit that copy. By default, once a file has been selected for opening, you are prompted to decide whether to edit the original or make a copy.

If you do not want to be presented with this dialog box each time a file is opened, set the copy or edit original option as the default.


Copy File
IMPORTANT
All changes to the loaded file will be immediately written to disk, overwriting the file contents. It is therefore recommended that a copy of the file is used for editing in case recovery is necessary.
Do you want to edit a copy of this file?
No, I want to edit the original.
Yes
E:\Samples\Copy of Ad_10s.mpg
Browse...
Always use the above setting when opening a file
Note: If the above box is ticked, this dialog will not appear again until the "Always Ask" setting is selected in the Edit..Options dialog.
OK
Cancel

It is recommended that this dialog box be left as the default option.

If someone else has used the MPEG Test System, it is a good idea to look at the Options before opening a file.

To edit the original (useful when making edits to a file that is already a copy) select the No, I want to edit the original option, and then select the OK button.

To make a copy, select the Yes option, specify the copy file, and then select OK. While the copy is being made, the pointer changes to the busy pointer, usually an hour glass.

When the Edit a copy option is selected, the dialog box suggests a suitable filename, whihc you can edit. To look for a different directory or filename, select the Browse… button. This will open a standard file browser window, like this:

Menus and Controls

The following pages contain descriptions of the different menu options, toolbar controls, status bar, and slider bar.

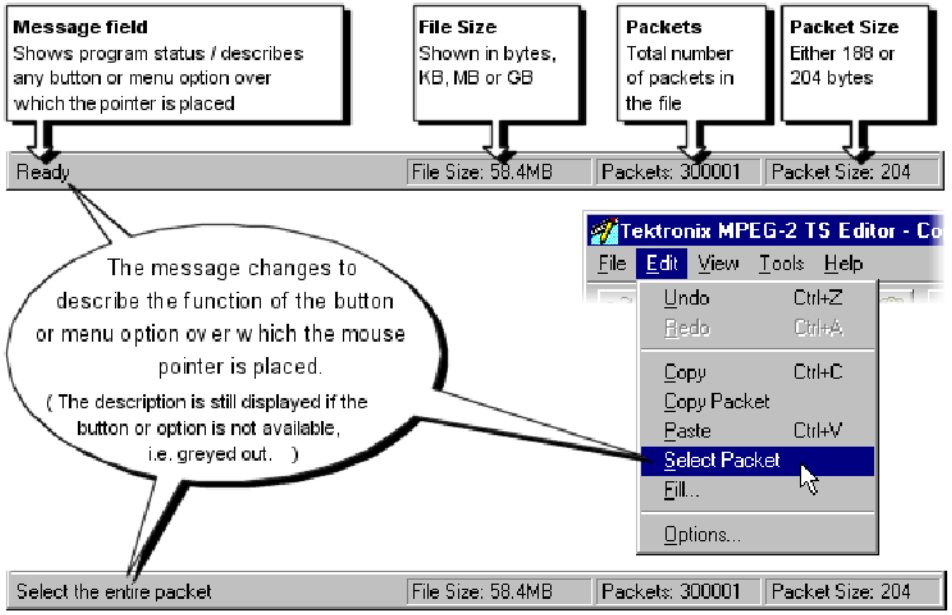
Toolbar

The Toolbar provides a set of convenient shortcuts for the more frequently used menu options. The available commands are:

	Opens a file. If a file is currently open, it will be closed when a new file is selected.
	Closes the current file. There is no save option because all changes are written to file immediately.
	Prints the current packet.
	Opens a print preview of the current packet.
	Copies the bytes that are currently selected in the Hexadecimal Editor from the packet to the clipboard. The bytes are copied using the hexadecimal representation. This button is disabled (grayed out) when nothing is selected that can be copied.
	Copies the entire contents of the current packet to the clipboard.
	Pastes any data, held in the TS Editor's hexadecimal representation, from the clipboard into the packet starting at the currently selected byte.
	Undoes the last edit, restoring the previous value. Selecting Undo again undoes the previous change and so on.
	Reinstates the previously undone change.
	Opens the Options dialog box.

Status Bar

The Status Bar may be hidden from view, but if it is always visible at the bottom of the window. It displays the following information about the program and open file:

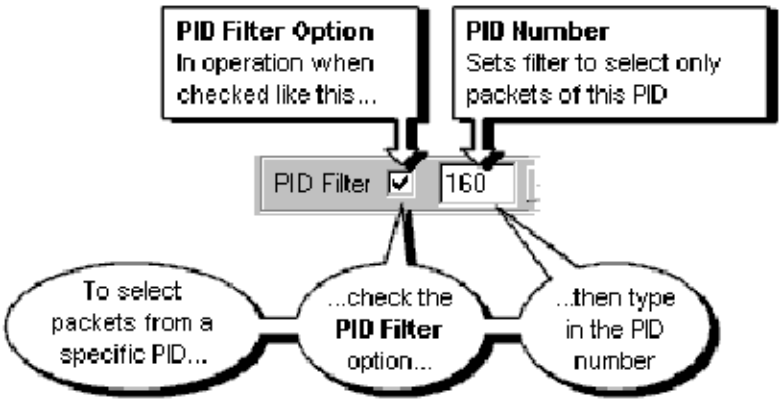


When no file is open, the File Size, Packets, and Packet Size fields are all set to zero or null:

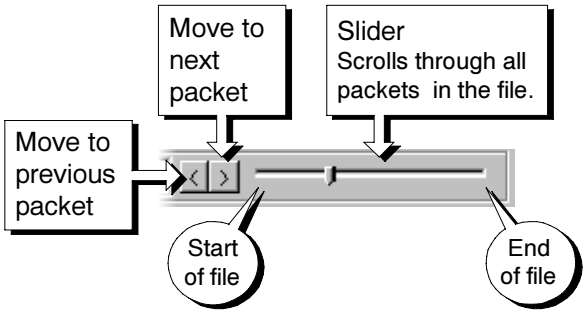
Slider Bar

The contents of any transport stream packet in the currently open file can be selected using the Slider bar. Packets are numbered according to their position in the file, with the first packet being 0 (zero). The controls in the slider bar are:

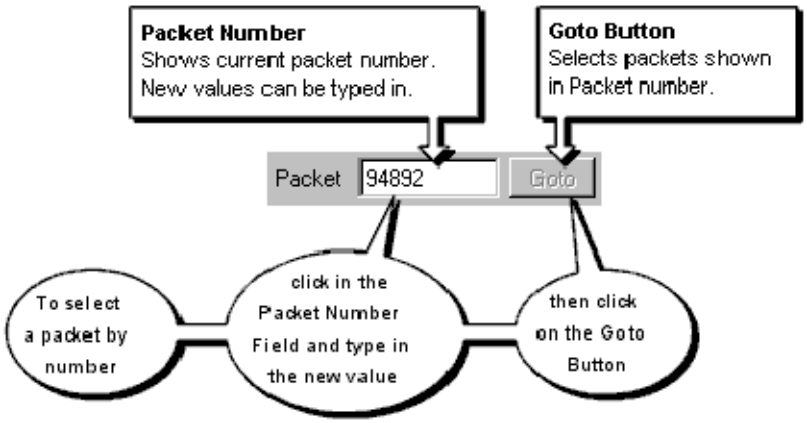
PID Filter


PID Filter Option
In operation when checked like this...
PID Number
Sets filter to select only packets of this PID
PID Filter
160
To select packets from a specific PID...
...check the PID Filter option...
...then type in the PID number

Slider



Packet Number



It is normal to edit a copy of a transport stream. Transport Stream Analyzer uses the same packet numbering as Editor. So the packet number can be used to find and view a packet in Analyzer, and then edit the copy of the same packet in Editor.

The Slider Bar can be dragged from the edge of the main window into a floating pallet. To do this, place the mouse pointer on the background (inside the Slider Bar), hold down the left mouse button, and drag the slider bar away from the window border. The result is a self contained window that looks like this:

To replace the Slider Bar on the window border drag, it over the border until the outline changes shape.

Menu Options

The following pages describe all of the menu options. Since many of the options are context sensitive, they will be available only when their function is appropriate for the selected window or display element. When a menu option is not available, the option is grayed out.

File Menu Options

Table 9–1 list the File menu options.

Table 9-1: File menu options

Command	Function
Open	Opens a file for editing. If a file is currently open, it is closed when a new file is selected.
Close	Closes the current file. There is no need for a save option because all changes are written to file immediately.
1 <filename> 2 <filename> 3 <filename> 4 <filename>	A list of the four most recently edited files. If the program has recently been installed, the list may be empty or hold less than four files.
Print	Prints the current packet.
Print Preview	Opens a print preview of the current packet.
Print Setup	Selects printer and configuration.
Exit	Closes any file that is open and terminates execution of the program.

Edit Menu Options

Table 9–2 list the Edit menu options.

Table 9-2: Edit menu options

Command	Function
Undo	Undoes the last edit, restoring the previous value. Selecting undo again undoes the previous change.
Redo	Reinstates the previously undone change.
Copy	Copies the bytes that are currently selected in the Hexadecimal Editor from the packet to the clipboard. The bytes are copied using the hex representation.
Copy Packet	Copies the entire contents of the current packet to the clipboard.
Paste	Pastes hexadecimal from the clipboard into the packet starting at the currently selected byte.

Table 9-2: Edit menu options (Cont.)

Command	Function
Select Packet	Selects the entire contents of the packet.
Fill	Prompts for and fills all selected bytes with a value.
Options …	Opens the options dialog.

View Menu Options

Table 9-3 list the View menu options.

Table 9-3: View menu options

Command	Function
Toolbar	Shows or hides the Toolbar, which provides a set of convenient shortcuts for the more frequently used menu options.
Status Bar	Shows or hides the Status Bar.
The following menu options select which standard is used to interpret the values held in the Transport Scrambling Code field. Only one standard can be selected at any time.	
MPEG2	Selects the MPEG2 interpretation of the Transport Scrambling Code.
DVB	Selects the DVB interpretation of the Transport Scrambling Code.
ATSC	Selects the ATSC interpretation of the Transport Scrambling Code.

Tools Menu Options

Table 9-4 list the Tools menu options.

Table 9-4: Tools menu options

Command	Function
Remap PIDs…	Starts the tool to Remap packets from one or more PIDS to different PIDs.
PCR Recalculation…	Opens a Wizard to Recalculate the Program Clock References (PCR) carried in one or more PIDS.

Help Menu Options

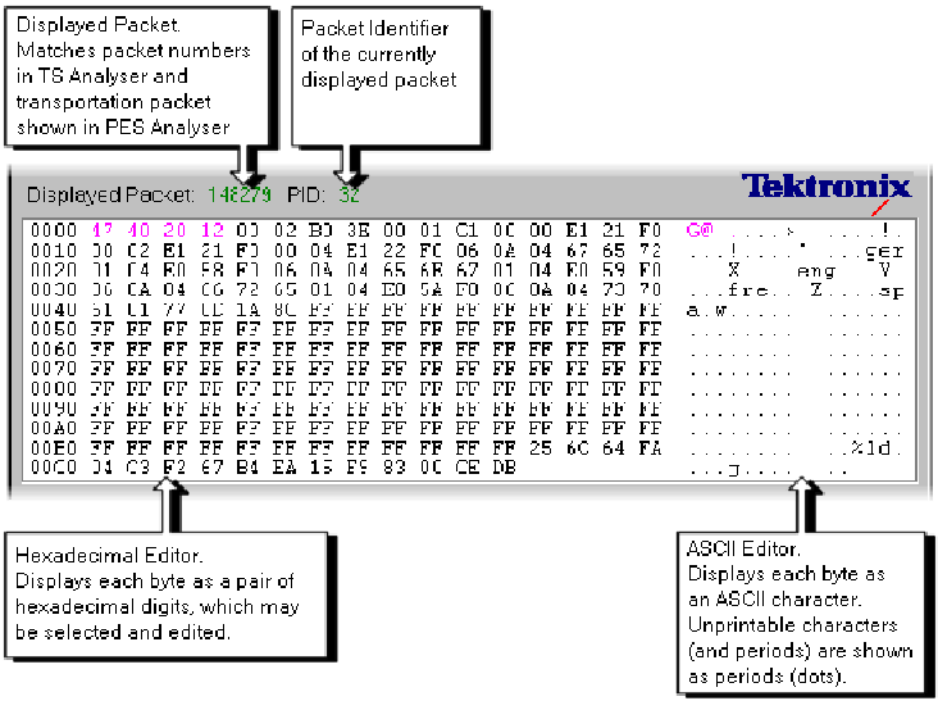
Table 9–5 list the Help menu options.

Table 9-5: Help menu options

Command	Function
About…	Displays the program version number and license number.

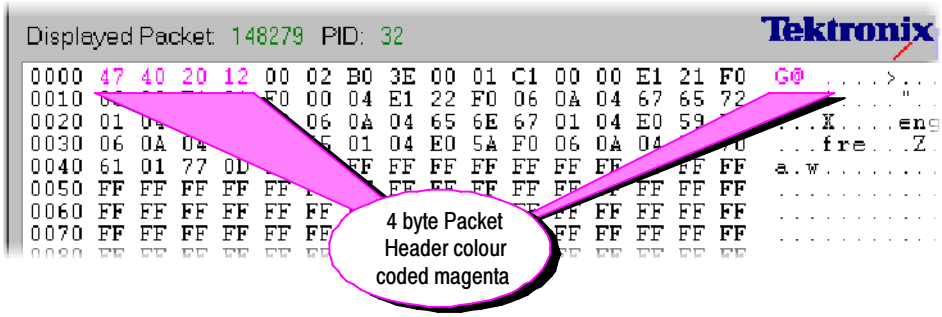
Hex Editor

The Hex Editor displays and provides editing facilities for the contents of the current packet in both hexadecimal representation and ASCII characters.

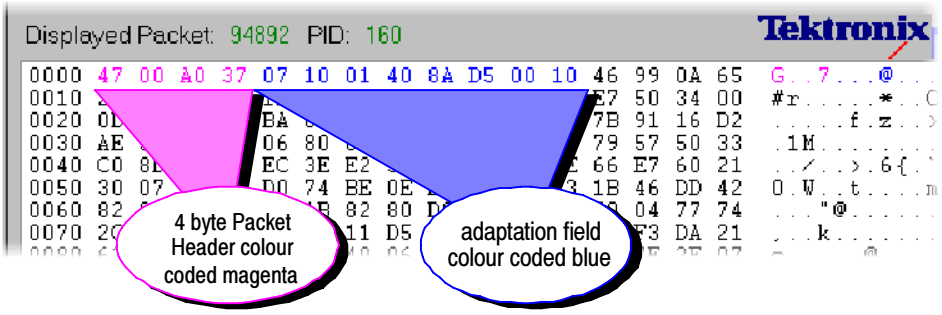

Displayed Packet. Matches packet numbers in TS Analyser and transportation packet shown in PES Analyser
Packet Identifier of the currently displayed packet
Displayed Packet: 148279 PID: 32
Tektronix
Hexadecimal Editor. Displays each byte as a pair of hexadecimal digits, which may be selected and edited.
ASCII Editor. Displays each byte as an ASCII character. Unprintable characters (and periods) are shown as periods (dots).

Color Coding

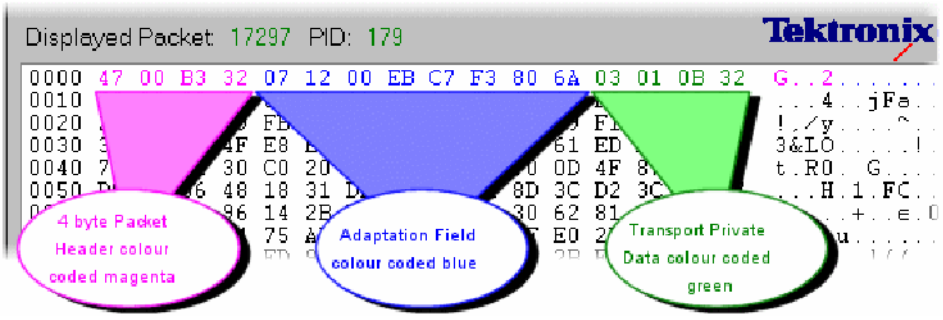
Color coding is used to show the “footprint” of various header fields, in both the hexadecimal and ASCII views. The packet payload and any Reed Solomon data is shown in black. The bytes of the packet header field are shown in magenta text.



When an adaptation field is present it is shown by blue colored text:


Displayed Packet: 94892 PID: 160
Tektronix
4 byte Packet Header colour coded magenta
adaptation field colour coded blue

If transport private data is present it is shown in green:


Displayed Packet: 17297 PID: 179
Tektronix
4 byte Packet Header colour coded magenta
Adaptation Field colour coded blue
Transport Private Data colour coded green

NOTE. *It is possible to define a transport private data area that is not contained within the adaptation field area specified by the adaptation field length.*

Selecting & Editing

One or more bytes can be selected using either the hexadecimal or ASCII view. Changes are made using options from the menus and by typing new values in the hexadecimal view.

When the mouse pointer is moved over either of the views in the Hex Editor, the pointer changes to the Text Select pointer.

Individual Bytes

To edit a byte or character, position the mouse pointer over the desired character in either the ASCII or hexadecimal view. Then click the left mouse button. A flashing inverse video cursor appears to the left of the character.

Alternatively, double-click either view of the byte to select it for use with an option from the Edit menu operation.

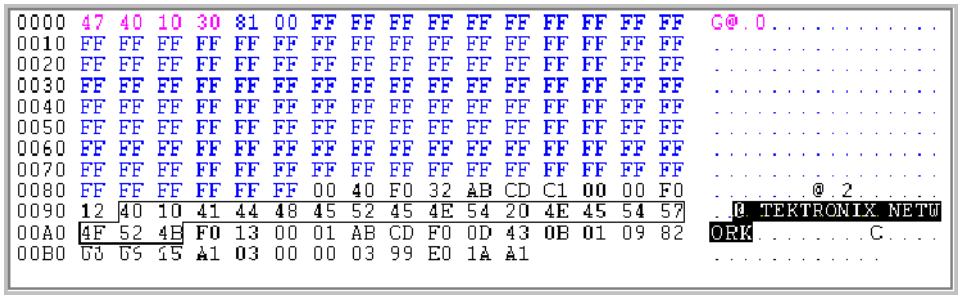
New values can be entered from the keyboard. As each character is typed, the cursor moves on to the next. It can be repositioned with the mouse or by using the up, down, left and right cursor keys.

The cursor will not move forward beyond the end or back before the start of the packet. To select another packet, use the Slider Bar.

Block of Bytes

A block of bytes can be selected for operations such as copying to the clipboard or filling with the same value.

Click on the first required byte and hold down the left mouse button. Then drag the mouse pointer to the last byte to be selected and release the left mouse button. Both the ASCII and Hex views can be used for selection. The selection is shown in inverse video in the view from which the it was made, and by an outline around the selection in the other view. For example, when made from the ASCII view, a selection looks like this:

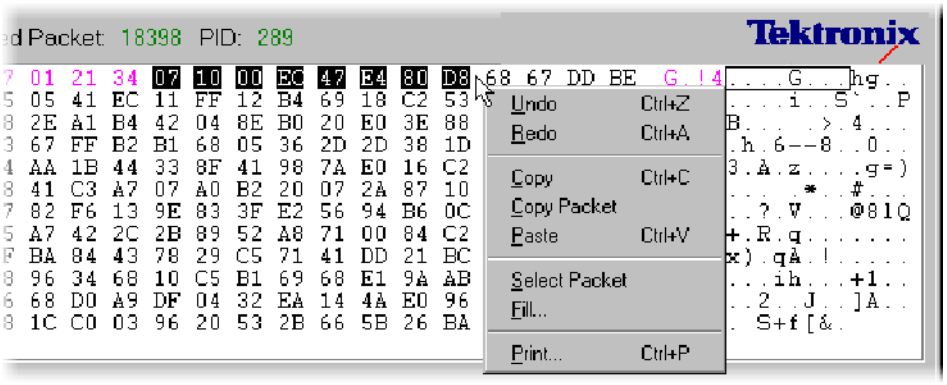

0000 47 40 10 30 81 00 FF FF FF FF FF FF FF FF FF FF G@.0
0010 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0020 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0030 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0040 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0050 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0060 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0070 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0080 FF FF FF FF FF FF 00 40 F0 32 AB CD C1 00 00 F0 .@.2
0090 12 40 10 41 44 48 45 52 45 4E 54 20 4E 45 54 57 .@.TEKTRONIX NETW
00A0 4F 52 4B F0 13 00 01 AB CD F0 0D 43 0B 01 09 82 ORK.C
00B0 00 05 15 A1 03 00 00 03 99 E0 1A A1

Once selected, the block of bytes can be edited with the available options from the Edit and the Pop-Up menus. Clicking the mouse or pressing a cursor key clears the selection.

To select a block using the cursor keys: position the cursor on the first byte, and then hold down the Shift key and move the cursor with the cursor keys. The selection is drawn between the initial and current cursor positions. Release the Shift key when the cursor has reached the last byte. Clicking the mouse or pressing a cursor key clears the selection.

Editing Commands

The Edit menu, pop-up menu, and toolbar buttons provide a variety of options for editing the packet contents. The Pop-Up menu is opened by clicking the right mouse button when the pointer is over the Hex Editor, for example:



Depending on what operations have recently been performed and on what is selected, the menus and toolbar will offer different commands. The complete set of menu options and associated buttons are as follows:

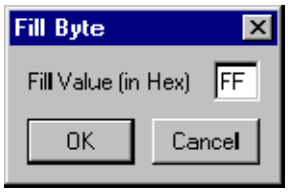
Undo — TS Editor keeps a list of recent changes. Each Undo command backs out the most recent change from the list. That change is moved to the Redo list in case it needs to be reinstated. As each change is undone the cursor moves to the appropriate field (in the Hex or Header Editors) and restores the previous value.

Redo — Reinstates the most recently undone operation. When a new edit is made, the Redo list is cleared.

Copy — Copies the currently selected bytes to the clipboard. From there they may be pasted in to other packets or used by other applications.

Copy Packet — Copies the entire contents of the current packet to the clipboard. From there it can be pasted into other packets or used by other applications.

Paste	Pastes packet contents held on the clipboard into the current packet, starting at the current cursor position.
Select Packet	Selects the entire packet. This is a quick alternative to selecting all the packets with the mouse or keyboard.
Fill	Fills all the selected bytes with a hexadecimal value.



This option opens the Fill Byte dialog box. Enter the fill value then select the OK button. The Cancel button abandons the operation, leaving the bytes in their original state.

There are no Toolbar buttons for the Select Packet and Fill commands.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

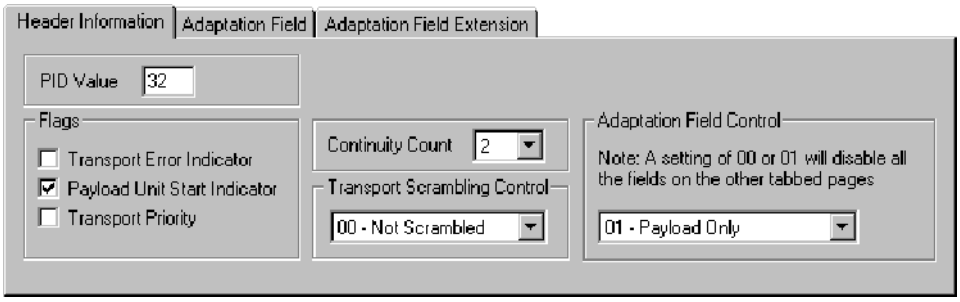
Header Editor

The Header Editor has three tabs. These show and allow editing of the basic header, adaptation field, and the adaptation field extension contents. The Hex editor is immediately updated to show the new values when changes are made in the Header Editor.

Binary flags are shown with check boxes whose state can be changed by clicking in the box with the mouse pointer. Multi-bit fields may be edited by typing in the new values or selecting a value from a drop down list.

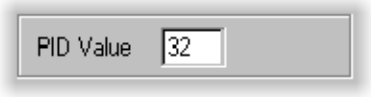
NOTE. *It is important to remember that changing a flag or field often alters the structure of the header. The other flags and fields will be reinterpreted according to the data underlying their new position in the structure.*

Header Information Tab

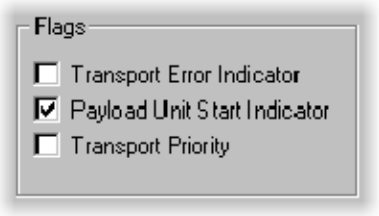


The Header Information Tab interprets the contents of the Packet Header (shown in magenta text in the Hex Editor) for ease of understanding and editing.

The PID Value field displays, and allows editing of, the 13-bit PID as a decimal value. (The PID is packed into a pair of bytes with the Flags shown below.)



The Flags fields display the state of each binary flag in a check box:

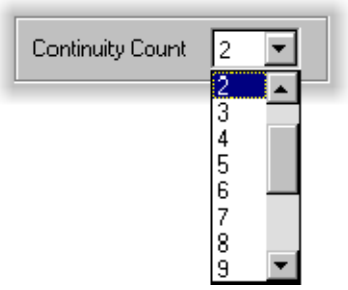


☐ = 0 or false

☑ = 1 or true

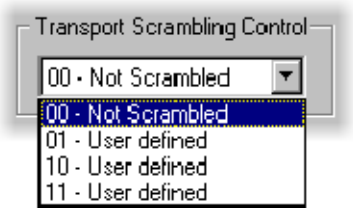
Click in the box to toggle the state of a flag.

The Continuity Count field displays the value of the four bit Continuity Count field in decimal.



To avoid any typing errors, the drop-down list allows selection of a different value.

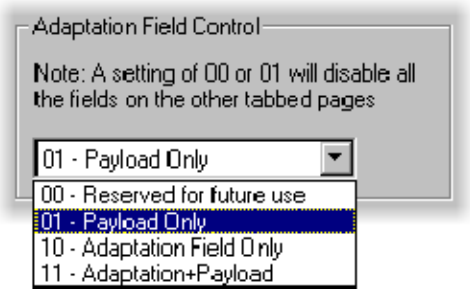
The Transport Scrambling Control displays the two bit Transport Scrambling Control field as a binary bit pattern, with a text description.



Use the drop-down list to select a different value.

The text gives the interpretation for the bit pattern according to the standard that is currently selected: MPEG2, DVB or ATSC. Use the View menu to select the required option.

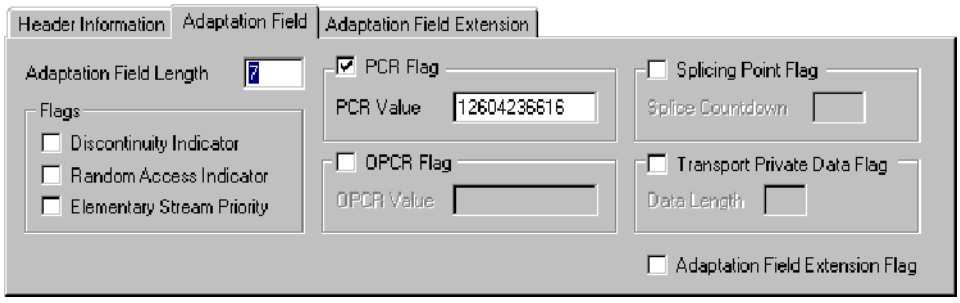
The Adaption Field Control displays the two bit Adaptation Field Control as a binary bit pattern, with a text description.


Adaptation Field Control
Note: A setting of 00 or 01 will disable all the fields on the other tabbed pages
01 - Payload Only
00 - Reserved for future use
01 - Payload Only
10 - Adaptation Field Only
11 - Adaptation+Payload

Use the drop-down list to select a different value.

The Adaptation Field and Adaptation Field Extension Tabs will be empty (grayed out) when the 01 - Payload Only or 00 -- Reserved values are selected.

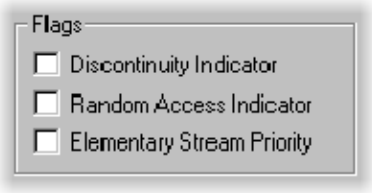
Adaptation Field Tab



The Adaptation Field Tab interprets the contents of the Adaptation field (shown in blue text in the Hex Editor) if one is present in the packet. To be able to edit an Adaptation Field, the Adaptation Field Control value in the Header Information Tab must indicate that an adaptation field is present.

The Adaption Field Length field shows the length of the Adaptation Field in bytes and allows it to be edited in decimal.

The Flags fields display the state of the binary flags in check boxes:

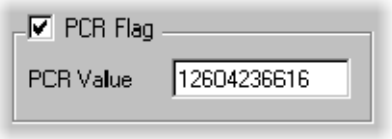


☐ = 0 or false

☑ = 1 or true

Click in the box to toggle the state of a flag.

The PCR Flag field displays the state of the binary PCR Flag in check boxes:

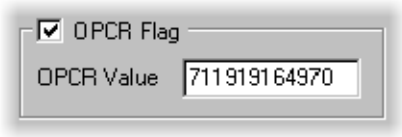


☐ = 0 or false

☑ = 1 or true

When the flag is true the PCR Value is shown and can be edited in decimal notation.

The OPCR field displays the state of the binary OPCR Flag in check boxes:

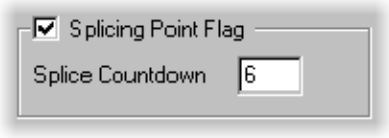


☐ = 0 or false

☑ = 1 or true.

When the flag is true, the OPCR Value is shown and can be edited in decimal notation.

The Splicing Point Flag fields displays the state of the Splicing Point Flag in check boxes:



☐ = 0 or false

☑ = 1 or true

When the flag is true, the Splice Countdown value is shown and can be edited in decimal.

The Transport Private Data Flag field displays the state of the Transport Private Data Flag:

☐ = 0 or false

☑ = 1 or true.

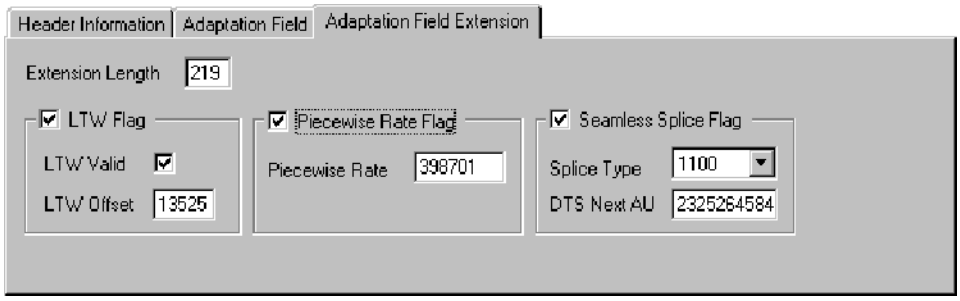
When the flag is true, the Data Length is shown in bytes and can be edited in decimal.

The Adaptation Field Extension Flag indicates the state of the binary Adaptation Field Extension flag.

☐ = 0, no Adaptation Field Extension.
The Adaptation Field Extension Tab can be viewed, but all of the fields will be grayed out.

☑ = 1, Adaptation Field Extension present.
The Adaptation Field Extension Tab will show and enable editing of the information contained in the Adaptation Field Extension.

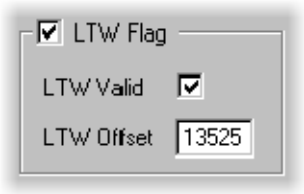
Adaptation Field Extension Tab



The Adaptation Field Extension Tab interprets the contents of the Adaptation Field Extension if one is present in the packet. To be able to edit an Adaptation Field Extension the Adaptation Field Extension flag must be set to 1 (the box must be checked) in the Adaptation Field Tab.

Shows the length of the Adaptation Field Extension in bytes and allows it to be edited in decimal.

Displays the state of the LTW Flag:

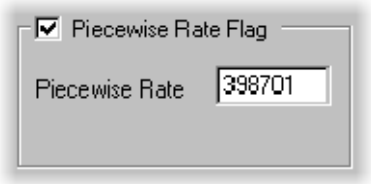


☐ = 0 or false

☑ = 1 or true

When LTW is true, the state of the LTW Valid flag and value of the LTW Offset are shown. The Valid flag may be toggled and new Offsets can be typed in decimal.

Displays the state of the Piecewise Rate Flag:

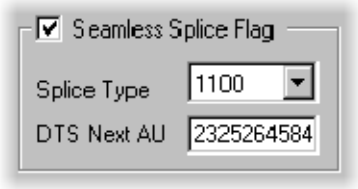


☐ = 0 or false

☑ = 1 or true

When the flag is true, the Rate is shown and can be edited in decimal notation.

Displays the state of the Seamless Splice Flag:

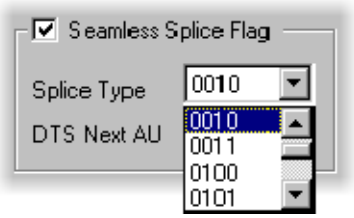


☐ = 0 or false

☑ = 1 or true

When the DTS Next AU value is shown and it can be edited in decimal notation.

The 4 bit Splice Type is shown as a bit pattern.



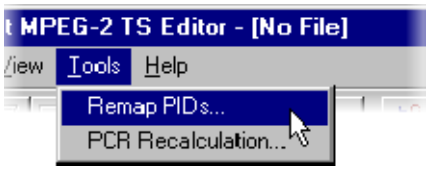
It has a drop-down list containing all 16 possible bit patterns.

Use the list to select a different value.

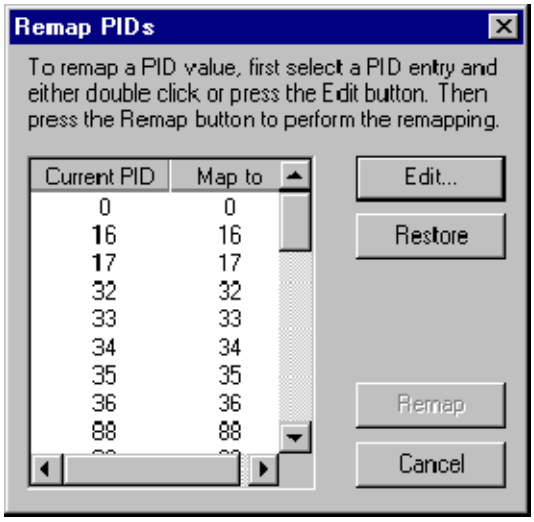
PID Remapping

***NOTE**. The packets of one or more PIDS may be remapped (moved to different PIDs). Only the PID in the packet headers is changed. Any packet payload contents, such as SI and PSI tables are unaffected. So remapping can break the references from tables to PIDs, or be used as an investigation to correct broken references.*

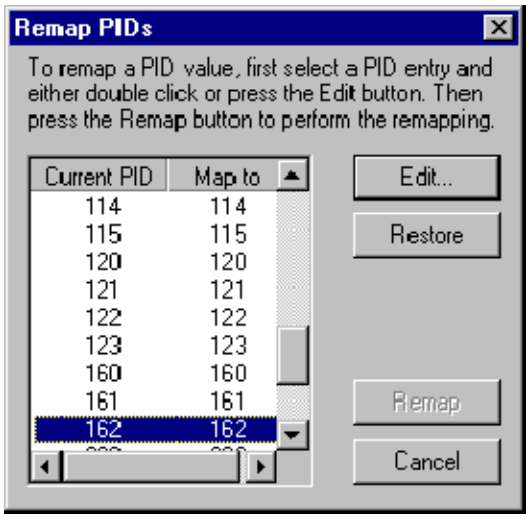
To remap packets from one or more PIDs, select the Remap PIDs… option from the Tools menu.



The program scans the file to build a list of PIDs, displaying the Hourglass mouse pointer while it is busy. It then opens the Remap PIDs dialog box:

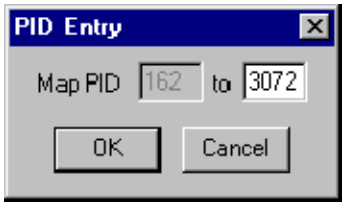


To specify a mapping from a current PID to a new PID, select the current PID entry from the list by clicking on it.



Now select the Edit... button, which opens the PID Entry dialog box. (Alternatively, double-click on the required entry in the list.)

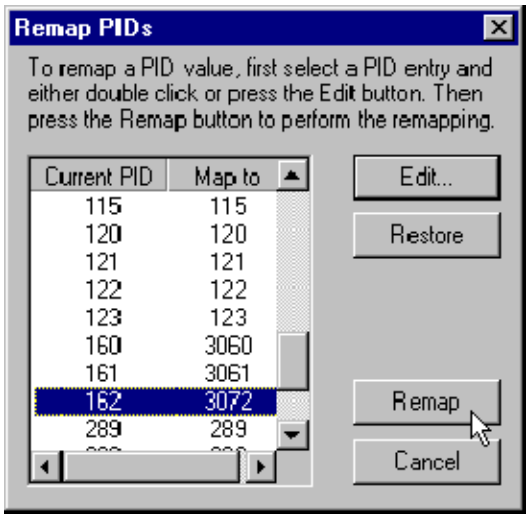
Type in the value for the new PID to map to and select OK.



Repeat this process for each PID that is to be remapped.

The Restore button will change the value of the selected Map to PID back to that of the Current PID without having to open the PID Entry dialog.

When all the mappings are specified, select the Remap button. (The Remap button is not enabled unless one or more mappings has been specified.)



The hourglass mouse pointer is displayed while the program performs the remapping. On completion, the dialog box closes and control is returned to the main window.

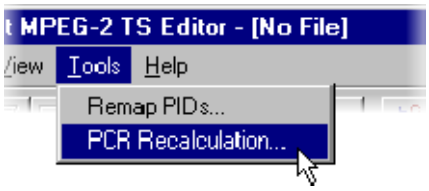
PCR Recalculation

The Program Clock References to one or all Programs can be changed. The rate can be changed and/or any one of six types of jitter added. Uses of PCR Recalculation include:

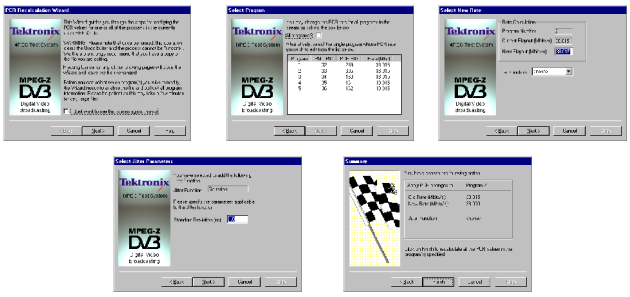
- Recalculating the rate at the correct value, without adding jitter, on a recording of a faulty stream can be used to remove suspected PCR problems. If the recalculated stream works correctly the problem is in the PCR.
- Creating test data with known deviations in rate for exercising other equipment.

***NOTE**. Do not perform PCR Recalculation on an original recording. This operation is not reversible, so it is strongly recommended that a copy of the original file is used.*

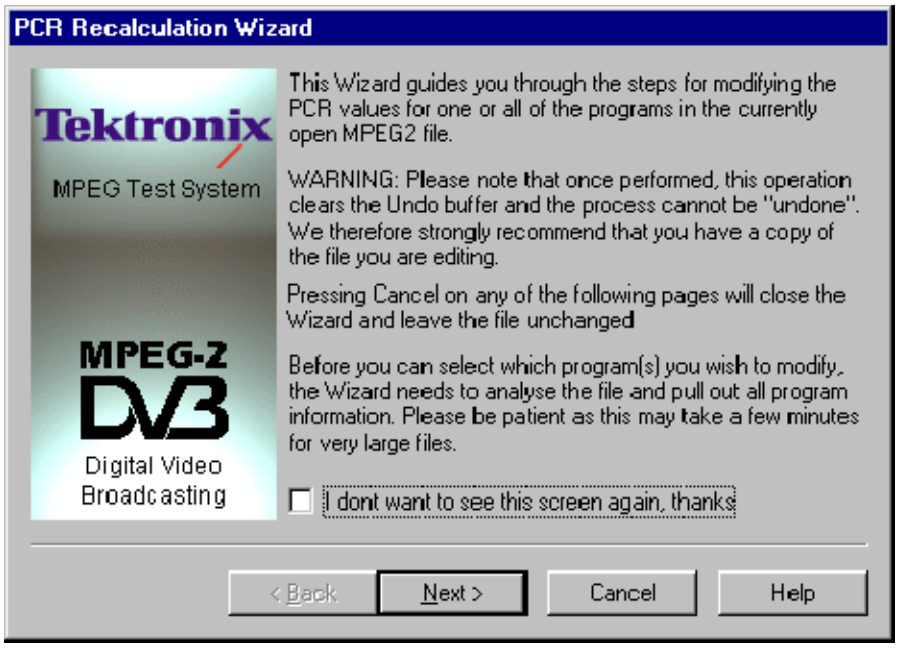
To modify the PCR, select the PCR Recalculation… option from the Tools menu.



This runs a wizard to analyze the program structure, guide the user through the available options, and then recalculate the PCR values.. The wizard presents 3, 4 or 5 pages depending upon the chosen options:

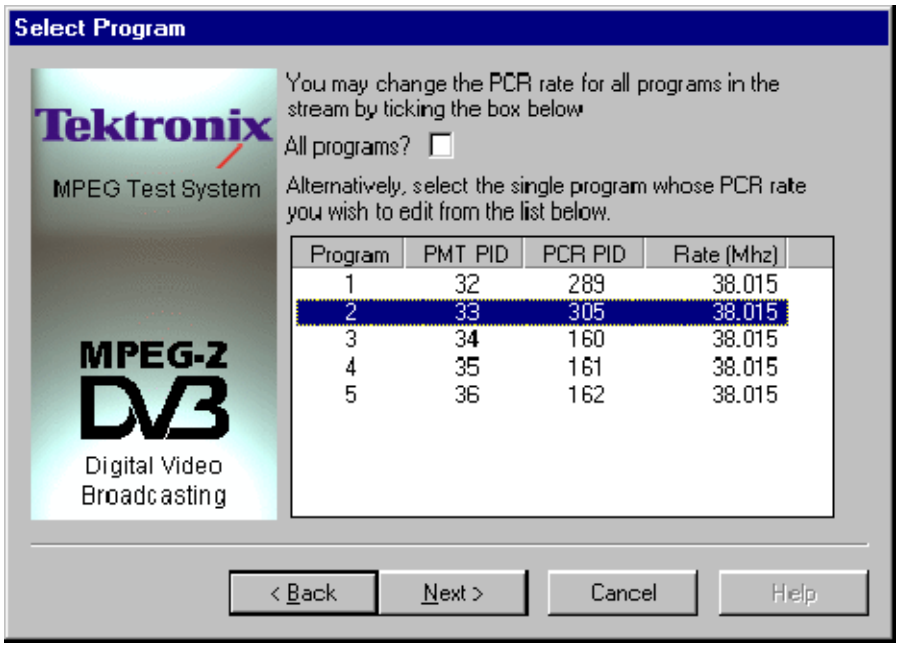


By default, the wizard will display this Introduction first.

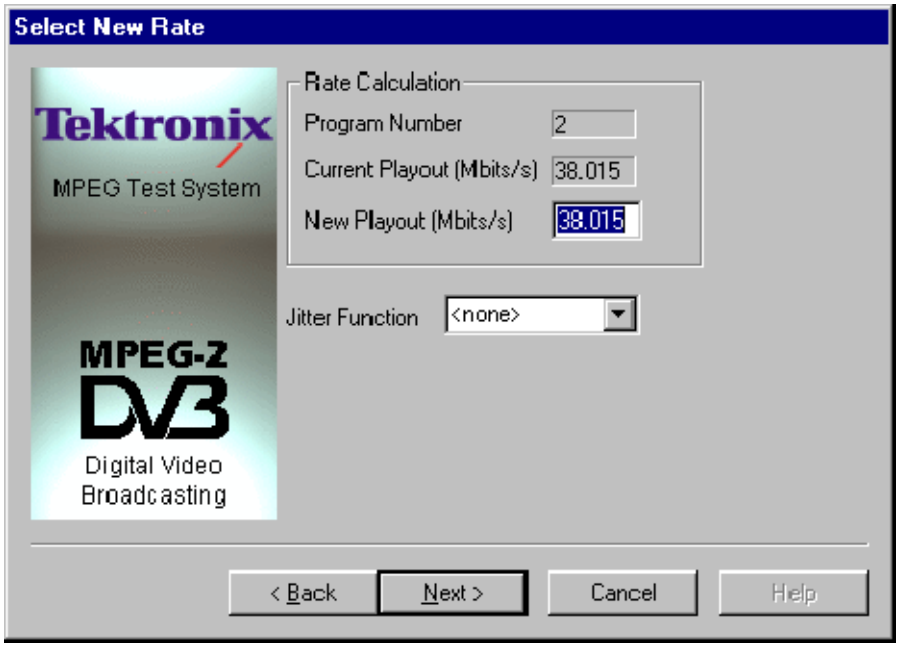

PCR Recalculation Wizard
Tektronix
MPEG Test System
MPEG-2
DVB
Digital Video
Broadcasting
This Wizard guides you through the steps for modifying the PCR values for one or all of the programs in the currently open MPEG2 file.
WARNING: Please note that once performed, this operation clears the Undo buffer and the process cannot be "undone". We therefore strongly recommend that you have a copy of the file you are editing.
Pressing Cancel on any of the following pages will close the Wizard and leave the file unchanged
Before you can select which program(s) you wish to modify, the Wizard needs to analyse the file and pull out all program information. Please be patient as this may take a few minutes for very large files.
I dont want to see this screen again, thanks
< Back
Next >
Cancel
Help

It may be disabled for future recalculations by selecting the check box option at the bottom of the introductory text. Selecting the Next button moves on to the Select Program page.

The wizard has to analyze the file to extract the relevant Program Information, which may take a while. When analysis is complete, the Select Program page shows a list of the programs whose PCR values may be changed (see following illustration).

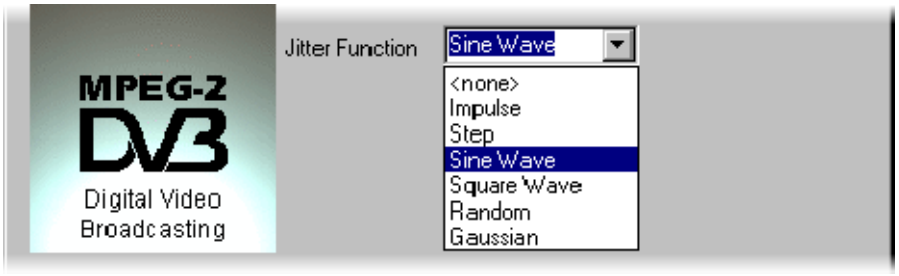


To recalculate the PCR rate for all the programs, check the All programs? option. Otherwise, select one of the programs from the list. Then select Next to move on to the Select New Rate page. The Back button moves back to the Introductory Page.



Keeping the rate as New Playout = Current Playout and selecting Jitter Function of <none>, will recalculate the PCR based on the current rate. This could be used, For example, to investigate a suspected problem with the PCR by playing the original and recalculated versions to see if there is a difference.

A new playout rate can be specified and/or a Jitter Function can be applied to the rate. There are seven Jitter Functions available including <none>. The available functions are:

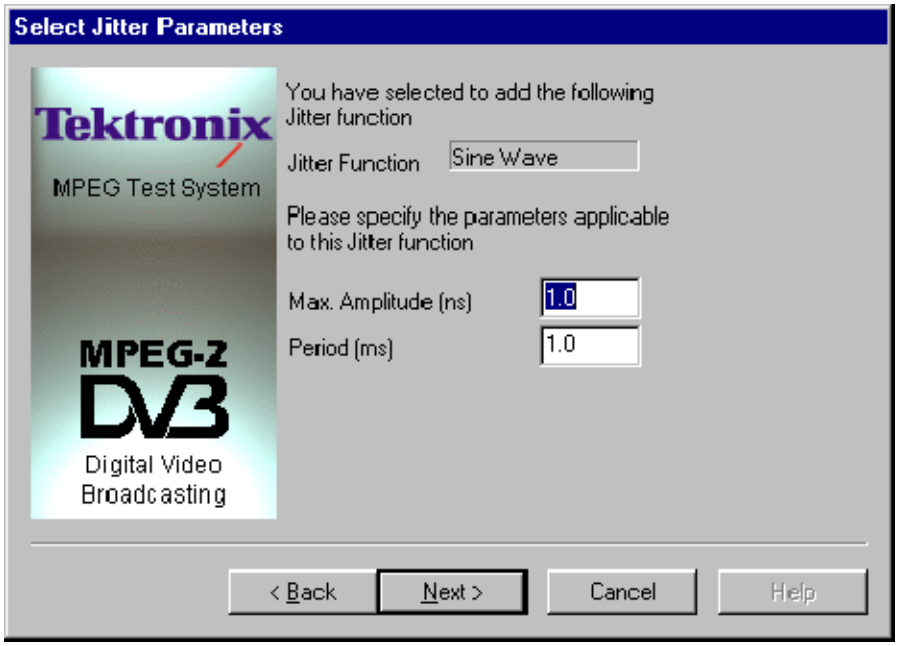


Each of the jitter functions is described in more detail at the end of this subsection.

If a Jitter Function is required, choose one of the six functions from the drop-down list, otherwise leave it set to <none>. Specify any change in the New Playout rate and select the Next button. Selecting Back returns to the Select program page.

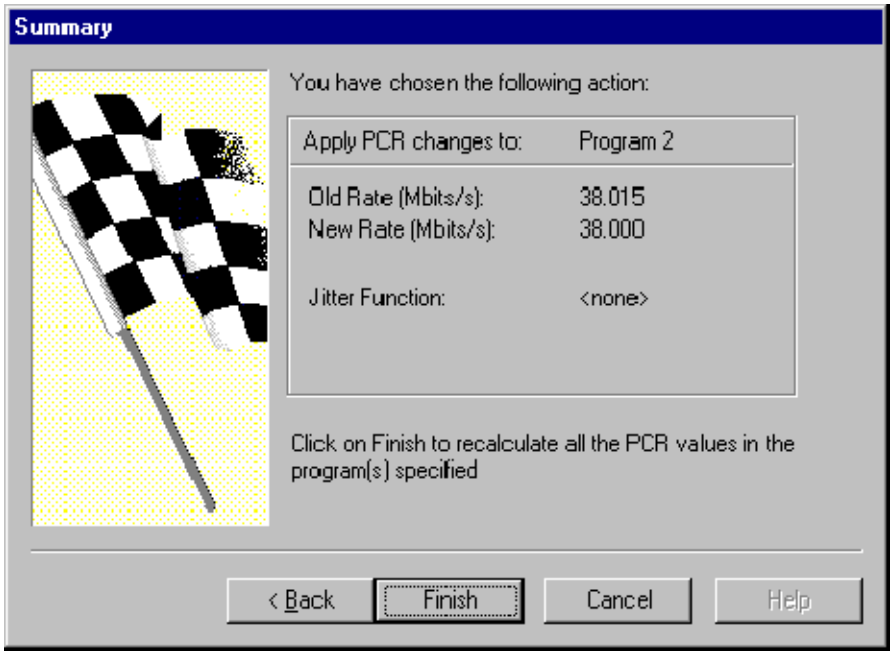
When no Jitter function, (<none>), was selected, the Select Jitter Parameters page will not appear. Go on to the Summary page, which shows a picture of a checkered flag.

With a Jitter Function selected, the next page will be Select Jitter Parameters. This asks for additional information specific to the chosen Jitter Function. For example, the Sine Wave function requires the parameters shown in the following illustration.



Specify the required parameters and select Next to move on to the Summary page. Use the Back button to return to the Select New rate page.

The Summary page displays a short list of the specified PCR rate changes.

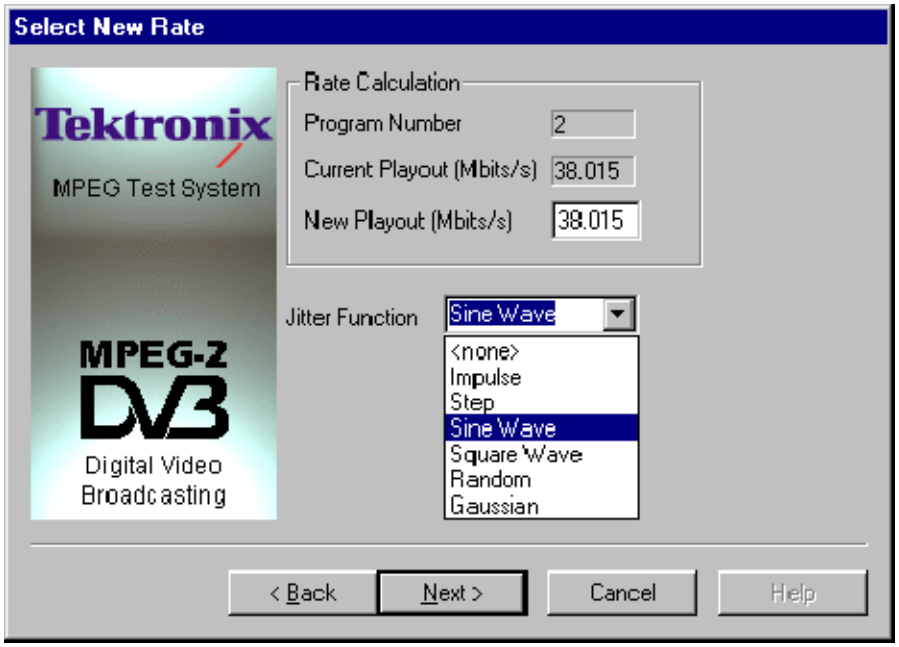


***NOTE**. Select Finish to recalculate the PCR values. Remember, once Finish has been selected, there is no going back.*

Use the Back button to return to the previous pages to make any changes.

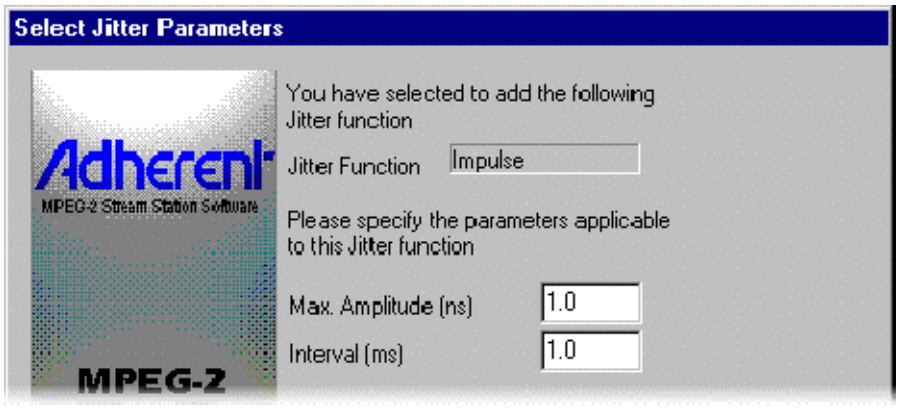
The program may take a while to perform the recalculations. The Summary page will stay on screen and the Hourglass mouse pointer be displayed while the wizard is processing. When the summary page disappears the calculation is complete and the file can be closed or edited.

Jitter Functions



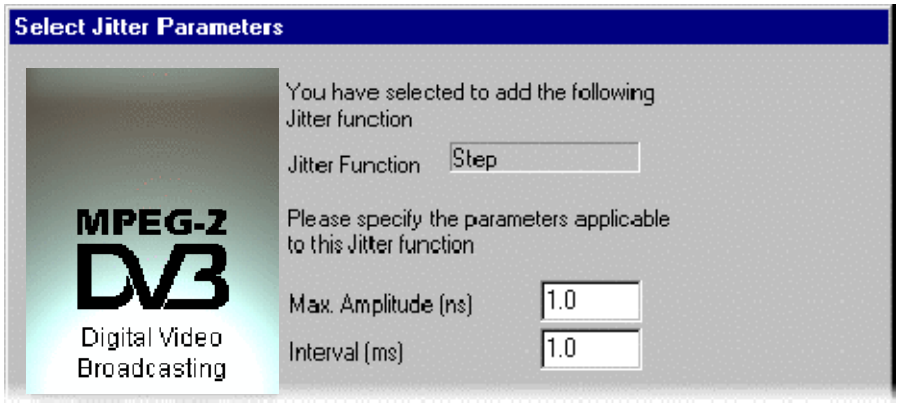
Select the required Jitter Function from the Select New rate page, then select Next to move on to the Select Jitter Parameters page to specify the parameters for the selected Jitter Function. The following subsections give details about each function.

Impulse The Impulse Jitter function adds a positive or negative value to a single PCR.



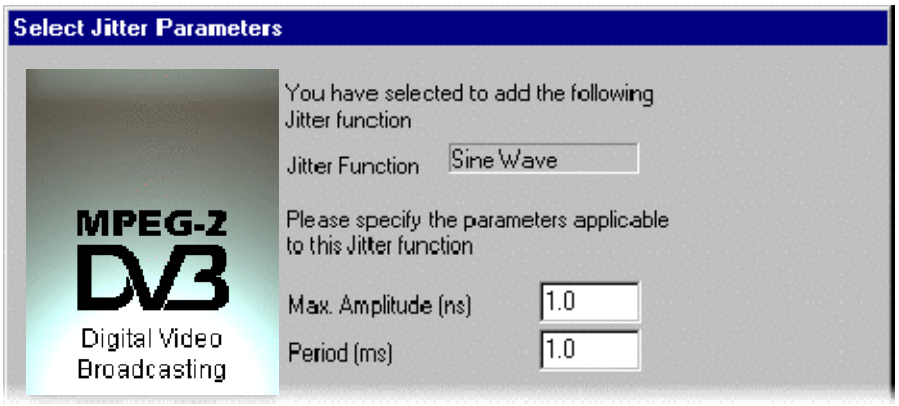
Max Amplitude	Specifies the size of the impulse in nano-seconds. Type a minus sign in front of the value for a negative impulse.
Interval	Specifies the time taken from the start of the file at which the Impulse is to be applied.

Step The Step Jitter Function adds a positive or negative offset to the ideal PCR values after a specified time. The offset will be the same for all PCRs.



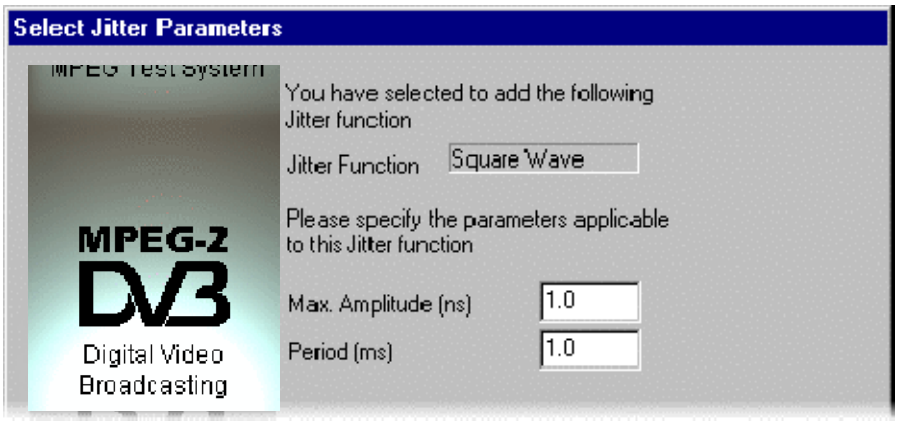
Max Amplitude	Specifies the size of the offset in nano-seconds. Place a minus sign in front of the value for a negative offset.
Interval	Specifies the time taken from the start of the file of the first PCR to which the offset is to be applied.

Sine Wave An offset that varies according to a sine function is applied to the ideal PCR value for each PCR.



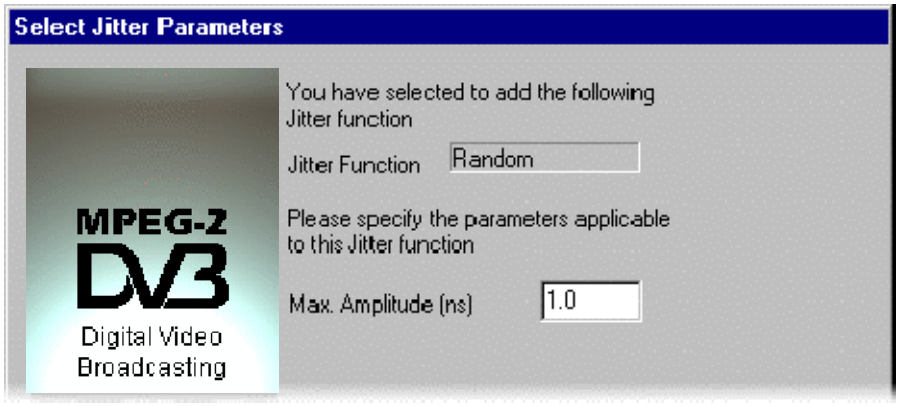
Max Amplitude	Specifies the amplitude of the sine wave in nanoseconds.
Period	Specifies the period of the sine wave in milliseconds.

Square Wave An offset, which varies according to a square wave function is applied to the ideal PCR value for each PCR. The square wave has an equal mark/space ratio.



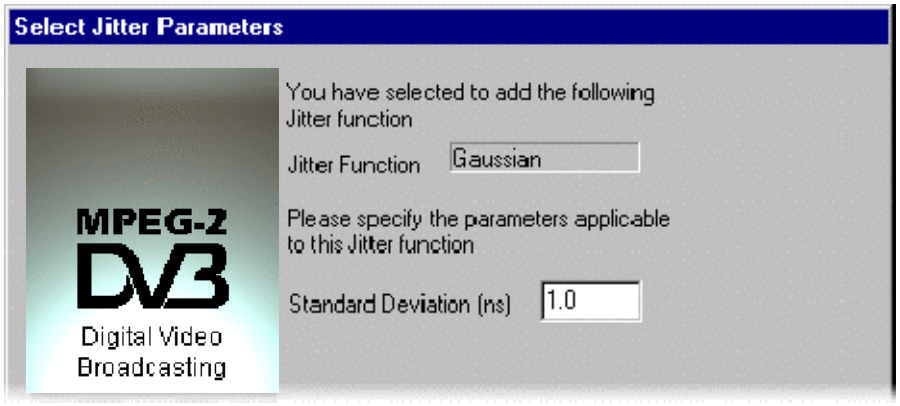
Max Amplitude	Specifies the amplitude of the square wave in nanoseconds.
Period	Specifies the period of the square wave in milliseconds.

Random The PCR jitter applies offsets of a uniform random distribution to the ideal values of the PCRs. Each offset will be within the range of ± the specified amplitude.



Max Amplitude — Specifies the maximum amplitude of the jitter, relative to the ideal value, that can be added to any PCR. Only a positive value can be entered. The amplitude is always from -Max. Amplitude to +Max. Amplitude centered on the ideal PCR value.

Gaussian The offsets are applied to the ideal PCR values following a Gaussian distribution according to the specified standard deviation.



Standard Deviation — Specifies the standard deviation to be used by the jitter function in deriving the offset for each PCR, relative to the ideal PCR value. Only a positive value can be entered for standard deviation.

MPEG Player

Getting Started

The MPEG Recorder & Player generates and captures MPEG–2 transport streams that are compliant with ATSC, DVB, and ARIB standards.

The MPEG Player provides the following features:

- Data rate: 213 Mbps maximum; 250 Kbps minimum.
- Hierarchical display of the stored or captured transport stream.
- 188, 204, 208 bytes packet size.
- Continuous recording of captured streams.
- PCR jitter insertion.
- Triggered stream capture.
- Full remote control using Ethernet interface.
- ASI, SMPTE 310M and DVB SPI (DVB Parallel) interfaces available.

Display Elements

There are two types of display screens to operate the MPEG Player; the Play screen and the Record screen.

- The Play screen is used to output the selected stream. When you open the application, this screen will display the last screen that was shown before closing.
- The Record screen is used to record the input stream.
  When you select **File > Record**, the screen switches to the Record screen.

This subsection explains the name and functions of the display elements in the Play or Record screen.

Figure 10–1 shows the location of display elements of the Play screen. The Record screen display elements are the same.

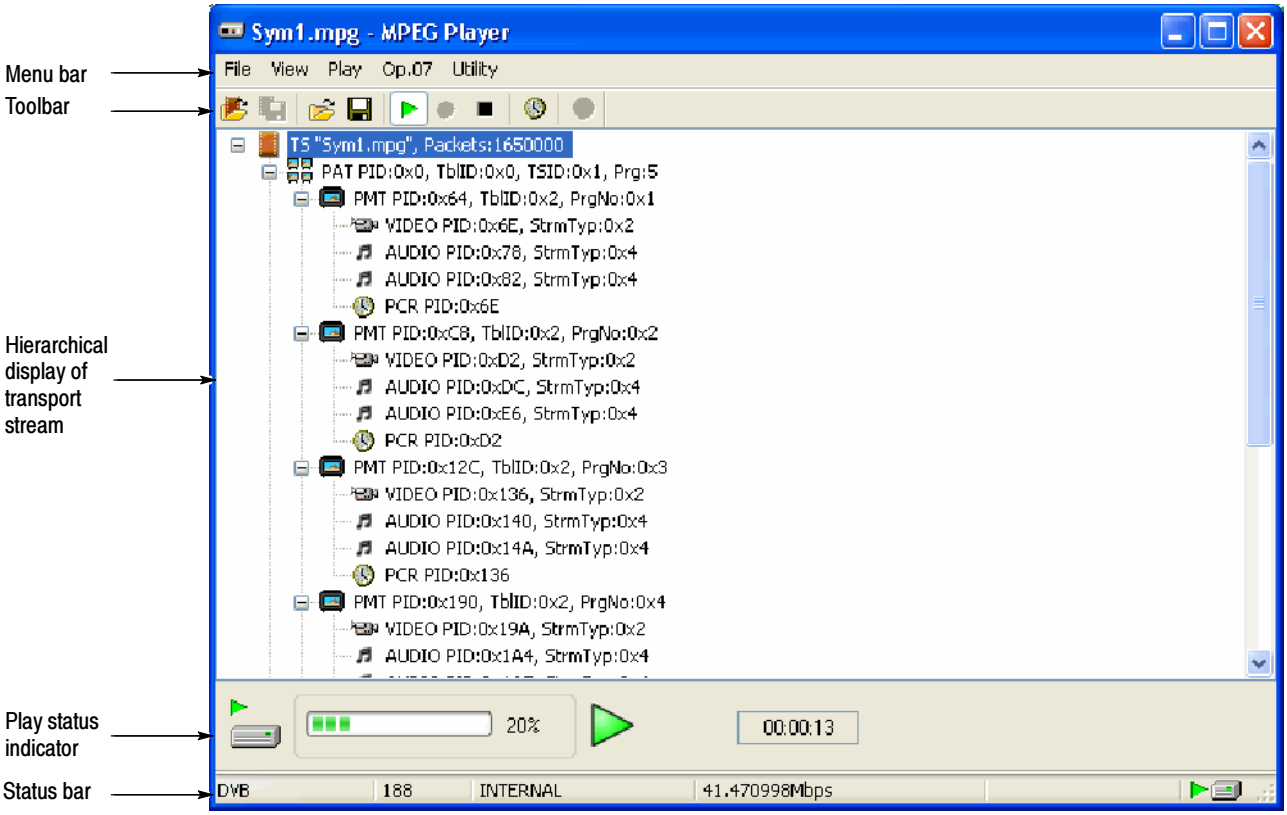


Figure 10-1: Elements of the Play screen

Menu Bar

The Menu bar displays the names of the menus that can be used in the Play or Record screen.

Refer to *Using the Menus* on page 10-19 for detailed information about the menus.

Toolbar

The toolbar provides shortcut buttons for many of the most often used menu commands. Click a toolbar button to select the corresponding command. You can toggle the toolbar display on and off using Toolbar command in the View menu.

Refer to *Toolbar Buttons* on page 10-42 for detailed information about the function of each toolbar button.

Hierarchy Display

Each icon in the hierarchy display represents an element of the stream. The hierarchy text contains a description of the associated icon.

Refer to *Hierarchical Display* on page 10-7 for detailed information about the hierarchy icons.

Play/Record Status Indicator

The Play Status indicator (see Figure 10–2) is displayed while the selected stream is being output. It shows the output status of the selected stream: the progress of the stream output, the output source, the operational status, and the elapsed time.

The Record Status indicator is displayed while the input stream is being recorded. It shows the record status of the input stream: the progress of the stream record, the record target, and the elapsed time.

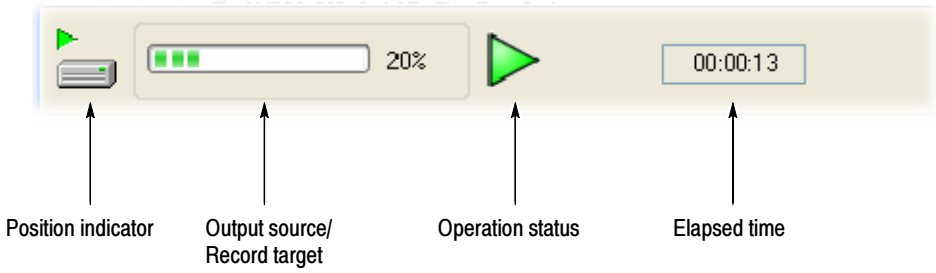


Figure 10-2: Play Status Indicator

The Play/Record Status indicator shows the following information:

Position Indicator In the Play screen, this indicator shows the progress of stream output using the duration gauge. In the Record screen, this indicator shows the progress of stream record using the duration gauge.

The duration gauge is updated every second. If you output a stream with a repetition rate of approximately three seconds, the gauge may not be displayed correctly.

Output Source/Record Target.

In the Play screen, this indicator shows the output source used to output the selected stream. In the Record screen, this indicator shows the record target that is used to record the input stream.

One of each set of icons is displayed, depending on the selections and status. The icons and their meanings are as follows:

The hard disk is being used for the output source or record target.

The RAM is being used for the output source or record target.

Operation Status Shows the current operation status of the instrument.

In the Play screen, the icons and meanings are as follows:

The selected stream is being output.

The selected stream is being read from the hard disk to the RAM.

In the Record screen, the icons and meanings are as follows:

(Red) The captured stream is being recorded.

(Red) The stream record is stopped.

(Yellow) The Player is waiting for a trigger event.

(Red) A trigger event has occured.

The captured stream is being processed on the hard disk.

The captured stream is being saved from the RAM to the hard disk.

Elapsed Time In the Play screen, this box displays the elapsed time of the current stream data output.

In the Record screen, this box displays the elapsed time since the input stream started recording.

Status Bar

The Status bar (see Figure 10–3) contains several indicators that display general information about the transport stream output or record status.

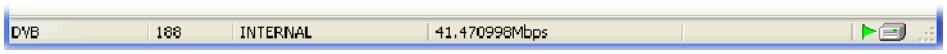


Figure 10-3: Status bar

From left to right, the Status bar shows the following information:

Standard — In the Play screen, this indicator shows the standard used to display the selected stream (MPEG2, ARIB, DVB, ATSC, S–TMCC, M–TMCC, or Non TS). In the Record screen, this indicator shows the standard used to display the input stream.

Packet Size — In the Play screen, this indicator displays the packet size in bytes (188, 204, 208 or Non TS) of the stream output. In the Record screen, this indicator displays the packet size in bytes of the input stream.

Clock Source — This indicator displays the source of the reference clock (internal or external) used for the stream output.

Bit Rate — In the Play screen, this indicator displays the bit rate (Mbps) of the stream output. In the Record screen, this indicator displays the bit rate (Mbps) of the input stream.

RAM free space — In the Play screen, this indicator shows the RAM free space that can be used to output the selected stream. In the Record screen, this indicator shows the RAM free space that can be used to record the input stream.

Output Source/Record Target — In the Play screen, this indicator shows the output source used to output the selected stream. In the Record screen, this indicator shows the record target used to record the input stream.

This indicator is the same as the output source/record target indicator of the Play/Record Status indicator.

Remote Connection Status Icons

The remote connection status icons appear when a TCP/IP connection for remote control is established. The right icon shows the status of the TCP/IP connection (this icon is always displayed when the TCP/IP connection is established), and the left icon shows the lock status of the front-panel buttons and mouse input.

There are two display states:

This shows that the TCP/IP connection for remote control is established.

This shows that the TCP/IP connection for remote control is established and the front-panel buttons and mouse input are locked by the :SYSTem:KLOCk:STATe ON command.

To reset the lock status, select the ESC key (or send the :SYSTem:KLOCk:STATe OFF command).

When the TCP/IP connection is closed, the remote status icons disappear.

Hierarchical Display

The MPEG Player displays the selected transport stream using a hierarchical structure. This section describes the hierarchical display and defines each icon you may encounter in the display.

The MPEG Player uses icons displayed in a hierarchical structure to show the interrelationship of transport stream components (Figure 10-4). Additional information about each stream component such as PID and Table ID numbers is displayed next to each icon.

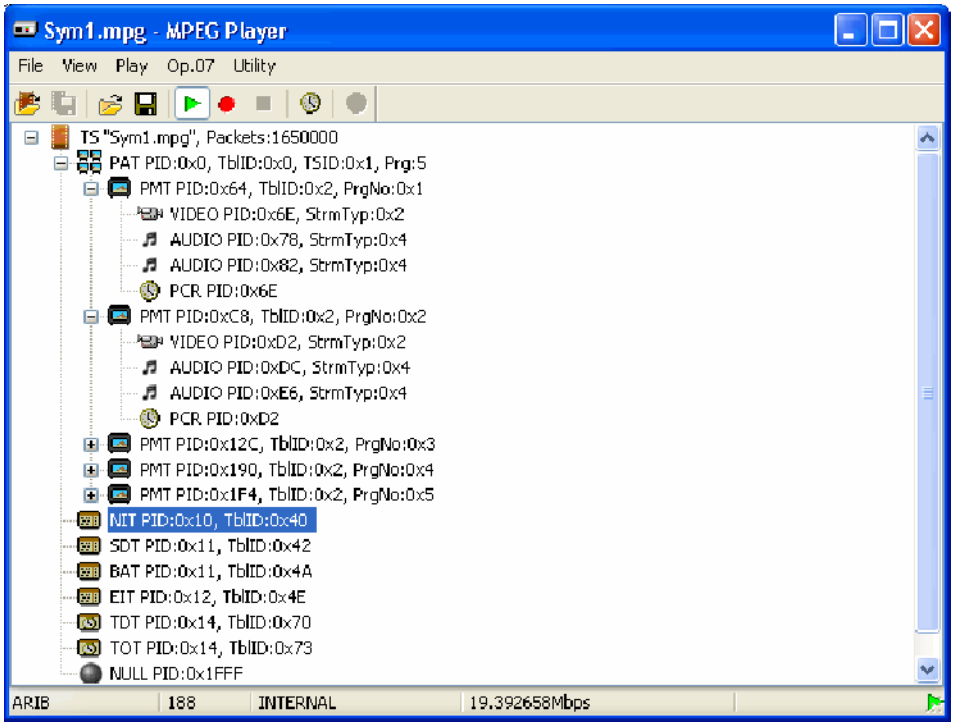


Figure 10-4: Example of the hierarchical display

The '+' symbol displayed to the left of some icons indicates that the item includes lower-level transport stream components that are not displayed. The symbol changes to '–' when the lower level components are displayed. To expand the hierarchy, click on the '+' symbol. Similarly, to collapse hierarchy, click on the '–' the selected upper-level icon press the left control button.

When a transport stream contains more items than will display on the screen at one time, a scroll bar appears at the right of the screen.

The icon cursor is used to select individual transport stream components as represented by the icons. The icon cursor is displayed as a red square (border)

surrounding an icon (see Figure 10–4). Use the arrow buttons to move the icon cursor through the hierarchy. The hierarchy display scrolls (if applicable) when the icon cursor reaches the top or bottom of the displayed portion of the hierarchy.

Click an element in the hierarchy to select (and highlight) it.

Hierarchical Display Icons

Table 10–1 describes the icons you may encounter in the hierarchical display of the MPEG Player for transport streams using the MPEG-2, ARIB, DVB and ATSC formats.

Table 10–2 describes icons that are specific to transport streams using DVB format.

Table 10–3 describes icons that are specific to transport streams using ARIB format.

Table 10–4 describes icons that are specific to transport streams using the ATSC format.

Refer to *Icon Text and Dialog Box* on page 10–15 for descriptions of the icon text and dialog box associated with the hierarchy icon.

Table 10-1: Icons used for MPEG-2, ARIB, DVB and ATSC formats

Icon	Element type
	ISDB-T Broadcast transport stream that is defined ARIB STD-B31.
	S-TMCC Transport stream to which TMCC information is inserted into 8 bytes in its Reed-Solomon area (16 bytes).
	M-TMCC Transport stream to which TMCC information is inserted into its sync byte area, and having super frame structure.
	Non TS Data stream other than transport stream format.
	Transport Stream (TS) This icon represents all transport stream packets that make up the stream.
	Program Assocation Table (PAT) One or more transport packets with a PID value and table_id value of 0x00.
	Transport Stream Description Table (TSDT) One or more transport packets with a PID value of 0x02 and a table_id value of 0x03.

Table 10- 1: Icons used for MPEG-2, ARIB, DVB and ATSC formats (Cont.)

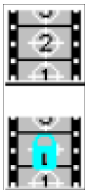
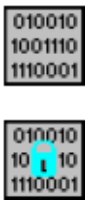
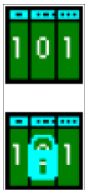
Icon	Element type
	Network Information Table (NIT) One or more transport packets with a PID value specified by the network_PID in the PAT.
	Conditional Access Table (CAT) One or more transport packets with a PID value of 0x01 and a table_id value of 0x0001.
	Program Map Table (PMT) One or more transport packets with a PID value specified by the program_map_PID in the PAT and a table_id value of 0x02.
	Program Clock Reference (PCR) One or more transport packets with a PID value specified by the PCR_PID in the PMT and a PCR_flag value of 1.
	Video elementary stream One or more transport packets with a PID value specified by the elementary_PID in the PMT and a stream_type value of 0x01, 0x02, or 0x10. A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.
	Audio elementary stream One or more transport packets with a PID value specified by the elementary_PID in the PMT and a stream_type value of 0x03, 0x04, or 0x11. A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.
	Audio AAC, Audio AC3 (ATSC format) One or more transport packets with a PID value specified by the elementary_PID in the PMT and a stream_type value of 0x0F or 0x81 (ATSC format). A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.
	Data stream One or more transport packets with a PID value specified by the elementary_PID in the PMT and a stream_type value of other than 0x01 to 0x05, 0x08, and 0x0F (in ATSC format, 0x81). A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.
	Private Section One or more transport packets with a PID value specified by the elementary_PID in the PMT and a stream_type value of 0x05. A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.

Table 10-1: Icons used for MPEG-2, ARIB, DVB and ATSC formats (Cont.)

Icon	Element type
	Digital Storage Media Command and Control (DSM-CC) One or more transport packets with a PID value specified by the elementary_PID in the PMT and a stream_type value of 0x08. A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.
	Entitlement Control Message (ECM) One or more transport packets with a PID value specified by the CA_PID of the CA_descriptor in the PMT, a payload_start_unit_indicator value of 1, and the payload does not start 000001 (section) or the payload starts 000001 (PES).
	Entitlement Management Message (EMM) One or more transport packets with a PID value specified by the CA_PID of the CA_descriptor in the CAT, a payload_start_unit_indicator value of 1, and the payload does not start 000001 (section) or the payload starts 000001 (PES).
	GHOST One or more transport packets with a PID value not specified in the PSI or Private Section PID file when the transport stream is downloaded.
	NULL One or more transport packets with a PID value of 0x1FFF.
	GARBAGE One or more transport packets in the section-data structure at the beginning of the section are not complete.
	Adaptation Field Error (ADFERR) One or more transport packets with an adaptation_field_control value of 0x00.

Table 10- 2: Icons specific to DVB format

Icon	Element type
	Service Description Table (SDT) One or more transport packets with a PID value of 0x0011 and a table_id value of 0x42.
	Bouquet Association Table (BAT) One or more transport packets with a PID value of 0x0011 and a table_id value of 0x4A.
	Event Information Table (EIT) One or more transport packets with a PID value of 0x0012 and a table_id value of 0x4E-0x6F.
	Running Status Table (RST) One or more transport packets with a PID value of 0x0013 and a table_id value of 0x4E-0x71.
	Stuffing Table (ST) One or more transport packets with a PID value of 0x0010-0x0013 and a table_id value of 0x72.
	Discontinuity Information Table (DIT) One or more transport packets with a PID value of 0x1E and a table_id value of 0x7E.
	Selection Information Table (SIT) One or more transport packets with a PID value of 0x1F and a table_id value of 0x7F.
	Time and Data Table (TDT) One or more transport packets with a PID value of 0x0014 and a table_id value of 0x72.
	Time Offset Table (TOT) One or more transport packets with a PID value of 0x0014 and a table_id value of 0x73.

Table 10-3: Icons specific to ARIB format

Icon	Element type
	Service Description Table (SDT) One or more transport packets with a PID value of 0x0011 and a table_id value of 0x42.
	Bouquet Association Table (BAT) One or more transport packets with a PID value of 0x0011 and a table_id value of 0x4A.
	Event Information Table (EIT) One or more transport packets with a PID value of 0x0012 and a table_id value of 0x4E-0x6F.
	Running Status Table (RST) One or more transport packets with a PID value of 0x0013 and a table_id value of 0x4E-0x71.
	Stuffing Table (ST) One or more transport packets with a PID value of 0x0010-0x0013 and a table_id value of 0x72.
	Discontinuity Information Table (DIT) One or more transport packets with a PID value of 0x1E and a table_id value of 0x7E.
	Selection Information Table (SIT) One or more transport packets with a PID value of 0x1F and a table_id value of 0x7F.
	Local event Information Table (LIT) One or more transport packets with a PID value of 0x0020 and a table_id value of 0xD0. One or more transport packets with a PID value specified by the elementary_PID in the PMT and a table_id value of 0xD0 when a stream type value is 0x05.
	Event Relation Table (ERT) One or more transport packets with a PID value of 0x0021 and a table_id value of 0xD1. One or more transport packets with a PID value specified by the elementary_PID in the PMT and a table_id value of 0xD1 when a stream type value is 0x05.
	Index Transmission Table (ITT) One or more transport packets with a PID value specified by the elementary_PID in the PMT and a table_id value of 0xD2.
	Partial Content Announcement Table (PCAT) One or more transport packets with a PID value of 0x22 and a table_id value of 0xC2.
	Software Download Trigger Table (SDTT) One or more transport packets with a PID value of 0x23 and a table_id value of 0xC3.

Table 10- 3: Icons specific to ARIB format (Cont.)

Icon	Element type
	Download Control Table (DCT) One or more transport packets with a PID value of 0x17 and a table_id value of 0xC0.
	DownLoad Table (DLT) One or more transport packets with a PID value specified by the DL_PID in the DCT and a stream_type value of 0xC1. A lock symbol appears in the icon when the transport_scrambling_control value is set to 01.
	Broadcaster Information Table (BIT) One or more transport packets with a PID value of 0x24 and a table_id value of 0xC4.
	Network Board Information Table (NBIT) One or more transport packets with a PID value of 0x25 and a table_id value of 0xC5 or 0xC6.
	Linked Description Table (LDT) One or more transport packets with a PID value of 0x25 and a table_id value of 0xC7.
	Time and Data Table (TDT) One or more transport packets with a PID value of 0x0014 and a table_id value of 0x72.
	Time Offset Table (TOT) One or more transport packets with a PID value of 0x0014 and a table_id value of 0x73.

Table 10-4: Icons specific to ATSC format

Icon	Element type
	Master Guide Table (MGT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xC7.
	Terrestrial Virtual Channel Table (TVCT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xC8.
	Cable Virtual Channel Table (CVCT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xC9.
	Rating Region Table (RRT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xCA.
	Event Information Table (EIT) One or more transport packets with a PID value specified by the table_type_PID in the MGT and a table_id value of 0xCB.
	Channel Extended Text Table (CETT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xC8.
	Event Extended Text Table (EETT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xC9.
	Program Identifier Table (PIT) One or more transport packets with a PID value specified by the elementary_PID in the PMT and a table_id value of 0xD0 when a stream_type value is 0x85.
	System Time Table (STT) One or more transport packets with a PID value of 0x1FFB and a table_id value of 0xCD.

Icon Text and Dialog Box

To the right of each icon, the MPEG Player displays text that describes each transport stream component. In addition, for the PCR icon, you can display a dialog box to change the parameters for the component. Table 10–5 shows the text that will be displayed with each icon.

Table 10- 5: Icon text

Component	Text
ISDB-T Icon	"xxx.rmx": Shows the file name. Packets: Shows the total number of packets in the broadcast transport stream.
S-TMCC Icon	"xxx.trp": Shows the file name. TC8PSK/xx, BPSK/xx, or QPSK/xx: Shows the modulation system and the number of contract slots (xx).
M-TMCC Icon	"xxx.trp": Shows the file name. SF: Shows the number of super frames.
Non TS Icon	"xxx.xx": Shows the file name. FileSize: Shows the file size in byte.
Transport Stream (TS) Icon	"xxx.trp": Shows the file name of the transport stream. Packets: Shows the total number of packets in the transport stream. When this icon is used with the S-TMCC or M-TMCC icon, the following text information is displayed: TSID: Shows the ID number for the transport stream. TC8PSK/xx, BPSK/xx, or QPSK/xx: Shows the modulation system and the number of contract slots (xx).
Program Allocation Table (PAT) Icon	PID: Shows the PID value of the PAT. TblID: Shows the table_id value of the PAT. TSID: Shows the transport_stream_id value of the PAT. Prg: Shows the number of programs contained in the transport stream.
Transport Stream Description Table (TSDT) Icon	PID: Shows the PID value of the TSDT. TblID: Shows the table_id value of the TSDT.
Network Information Table (NIT) Icon	PID: Shows the PID value of the NIT. TblID: Shows the table_id value of the NIT.

Table 10-5: Icon text (Cont.)

Component	Text
Conditional Access Table (CAT) Icon	PID: Shows the PID value of the CAT. TblID: Shows the table_id value of the CAT.
Program Map Table (PMT) Icon	PID: Shows the PID value of the PMT. TblID: Shows the table_id value of the PMT. PrgNo: Shows the program number associated with the PMT.
Program Clock Reference (PCR) Icon	PID: Shows the PID value of the PCR. See also *PCR Inaccuracy Dialog Box*, page 10-18.
Video Elementary Stream (VIDEO) Icon	PID: Shows the PID value of the video elementary stream. StrmTyp: Shows the type of the video elementary stream (0x01 or 0x02).
Audio Elementary Stream (AUDIO) Icon	PID: Shows the PID value of the audio elementary stream. StrmTyp: Shows the type of the audio elementary stream (0X03 or 0X04).
AUDIO_AAC and AUDIO_AC3 Icons	PID: Shows the PID value of the audio elementary stream. StrmTyp: Shows the type of the audio elementary stream (0X0F or 0x81).
Data Stream (DATA) Icon	PID: Shows the PID value of the data stream. StrmTyp: Shows the type of the data stream.
Private Section (DATA_SECT) Icon	PID: Shows the PID value of the private section. TblID: Shows the table_id value of the private section. StrmTyp: Shows the type of the private section.
DSM_CC Icon	PID: Shows the PID value of the data DSM-CC. StrmTyp: Shows the type of the DSM-CC.
Entitlement Control Message (ECM) Icon	PID: Shows the PID value of the ECM. TblID: Shows the table_id value of the ECM.
Entitlement Management Message (EMM) Icon	PID: Shows the PID value of the EMM. TblID: Shows the table_id value of the EMM.
GHOST Icon	PID: Shows the PID value of the GHOST.
Adaptation Field Error (ADFERR) Icon	PID: Shows the PID value of the ADFERR.

Table 10- 5: Icon text (Cont.)

Component	Text
NULL Icon	PID: Shows the PID value of the NULL.
GARBAGE Icon	PID: Shows the PID value of the GARBAGE.
SDT, BAT, EIT, RST, ST, DIT, SIT, LIT, ERT, ITT, PCAT, SDTT, DCT, DLT, BIT, NBIT, and LDT Icons	PID: Shows the PID value of the SDT, BAT, EIT, RST, ST, DIT, SIT, LIT, ERT, ITT, PCAT, SDTT, DCT, DLT, BIT, NBIT, or LDT. TblID: Shows the table_id value of the SDT, BAT, EIT, RST, ST, DIT, SIT, LIT, ERT, ITT, PCAT, SDTT, DCT, DLT, BIT, NBIT, or LDT.
TDT and TOT Icon	PID: Shows the PID value of the TDT or TOT. TblID: Shows the table_id value of the TDT or TOT.
MGT and PIT Icons	PID: Shows the PID value of the MGT or PIT. TblID: Shows the table_id value of the MGT or PIT.
TVCT, CVCT, RRT, EIT, CETT, and EETT Icons	PID: Shows the PID value of the TVCT, CVCT, RRT, EIT, CETT, or EETT. TblID: Shows the table_id value of the TVCT, CVCT, RRT, EIT, CETT, or EETT. TblType: Shows the table_type value of the TVCT, CVCT, RRT, EIT, CETT, or EETT.
System Time Table (STT) Icon	PID: Shows the PID value of the STT. TblID: Shows the table_id value of the STT.

PCR Inaccuracy Dialog Box. If you press the SELECT button when the PCR icon is selected, the PCR Inaccuracy dialog box appears as shown in Figure 10–5. This dialog box allows you to add jitter to the program_clock_reference_base value and the program_clock_reference_extension value.

Refer to *Adding Jitter to PCRs* on page 10–46 for more information.

Table 10–6 describes the PCR Inaccuracy dialog box parameters.

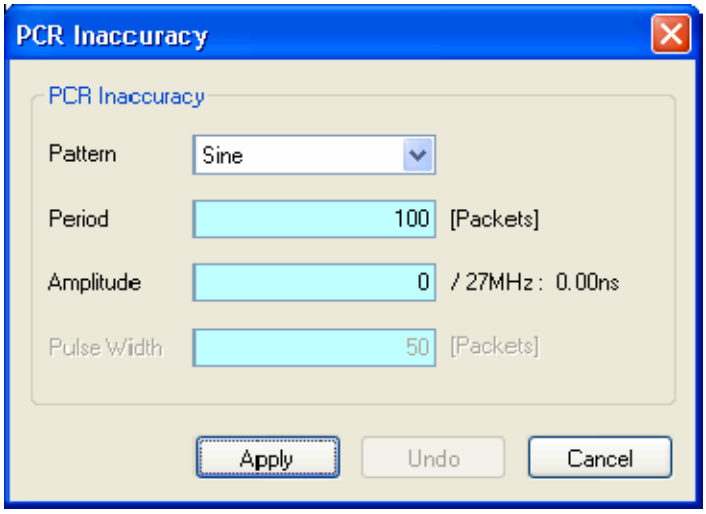


Figure 10-5: PCR Inaccuracy dialog box

Table 10-6: PCR Inaccuracy dialog box parameters

Parameter	Description
Pattern	Selects the waveform type of the waveform used to add jitter. You can select Sine, Square, Triangle, Pulse, Sawtooth, Random, or Offset.
Period	Sets the period of the waveform used to add jitter. You can set the value from 5 to 3000 packets in 1 packet steps.
Amplitude	Sets the amplitude of the waveform used to add jitter. You can set the value from 0/27 MHz to 135000000/27 MHz (0 s to 5 s).
Pulse Width	Sets the pulse width of the waveform used to add jitter. You can set the value from 1 to (period - 1) packet(s) in 1 packet steps. This Pulse Width parameter is available only when the Pattern parameter is set to Pulse.

Menus and Controls

This section describes the function of each selection available in the menus. This section is divided into the following subsections:

- *Menus in the Play Screen* describes all of the menu commands and their features available in the Play screen.
- *Menus in the Record Screen* describes all of the menu commands and their features available in the Record screen.
- *Toolbar Buttons* describes the toolbar buttons and their functions.

Menus in the Play Screen

This subsection describes the menus in the Play screen.

File Menu

The File menu in the Play screen contains commands for selecting a stream file and for loading and saving a preset file. Table 10–7 describes the commands in the File menu.

Table 10-7: File menu commands (Play screen)

Command	Description
Open	Opens a stream file stored in the E: drive (volume E). When a file is selected, the MPEG Player checks the packet size of the file. When it is a transport stream file, its data is output in packets. Therefore, if an incomplete packet is included at the start or end point of the file, the portion is not output. The function uses a standard Windows Open… dialog box.
Load Preset	Loads the specified preset file (*.set). When a preset file is loaded, the current instrument settings are changed by the file's content. Refer to *Preset File*, page 10-49, for more information about the preset file.
Save Preset	Saves the current instrument settings as a preset file. Refer to *Preset File*, page 10-49, for more information about the preset file.
RECORD	Switches to the Record screen.
Exit	Quits the MPEG Player application. The MPEG Player application settings are saved.

View Menu

The View menu contains commands that control the display of the Toolbar and Status bar. Table 10–8 describes the commands available in the View menu.

Table 10-8: View menu commands (Play screen)

Command	Description
Toolbar	Shows or hides the toolbar in the Play screen.
Status Bar	Shows or hides the status bar in the Play screen.

Play Menu

The Play menu contains commands for defining output parameters, such as packet size, output clock rate, and output source. Table 10–9 describes the commands available in the Play menu.

Table 10-9: Play menu commands (Play screen)

Command	Description
Packet Size	Sets the packet size (in bytes) for the stream. You can set the packet size to 188 (188 + 0), 204 (188 + 16), 208 (188 + 20) bytes, or Non TS. These packet sizes can only be set for an MPEG2 transport stream. For an S-TMCC or M-TMCC transport stream, the packet size is fixed to 204. For a Non TS stream, the packet size is fixed to Non TS. In addition, if you select 8VSB, the packet size is fixed to 188. When you select Non TS, the MPEG Player deals with stream data in a byte unit (not a packet unit) and outputs all of the data in a file. If a transport stream contains any error, you can output it by selecting Non TS.
Clock	Sets the clock rate of the stream output. When you select this command, the Clock dialog box appears. Refer to *Clock Dialog Box* on page 10–22 for more information.
Update	Sets whether to update parameters in the stream when looped. You can select On or Off. You cannot set to On for a Non TS stream. You can select which parameters in the stream are updated using the Others dialog box. Refer to *Others Dialog Box* on page 10–30 for more information.
Sync	Sets the format of the PSYNC signal output from the SPI IN/OUT connector. You can select TS Packet, SF, or Non TS. For TS Packet, a single pulse signal is output at the start point of each packet. For SF, a single pulse is output at the start point of the SF appearing every 204 X 48 X8 bytes. For Non TS, the Set Non-TS Sync dialog box appears, where you can enable the PSYNC and DVALID signals. Refer to *Set Non-TS Sync Dialog Box* on page 10–25 for more information.

Table 10-9: Play menu commands (Play screen) (Cont.)

Command	Description
PCR Initial Value	Sets the initial value of the program_clock_reference_base and program_clock_reference_extension parameters when the transport stream is output. When you select this command, the PCR Initial Value dialog box appears. Refer to *PCR Initial Value Dialog Box* on page 10-26 for more information.
Source	Selects the source for stream output. You can select RAM or Disk. Refer to *SPI/ASI/310M Interface Menu - Play* on page 10-34 for detailed information about differences between the two sources.
Loop	Sets whether or not the stream is output using looping method. You can select On or Off. If you set it to On, the selected stream is continuously output. If you set it to Off, the selected stream is output once.
Start/Stop	Sets the start and stop position of the stream, and initial start position of the stream for loop output. When you select this command, the Start/Stop Position dialog box appears. Refer to *Start/Stop Position Dialog Box* on page NO TAG for more information.
Auto play	Sets whether or not the transport stream is automatically output using the last power-down settings when you turn the MPEG Player on. You can select On or Off. If you set it to On, take care of the output level setting used when the MPEG Player was last turned off and the input level of the instrument (device) currently connected to the MPEG Player.
Timer Play	Sets the date and time used to output a stream automatically. When you select this command, the Timer Play/Record dialog box appears. Refer to *Timer Play/Record Dialog Box* on page 10-29 for more information.
Other	Sets the standard used to display the selected stream and display radix for the text information. When you select this command, the Others dialog box appears. Refer to *Others Dialog Box* on page 10-30 for more information.

Clock Dialog Box. When you select the **Clock...** command from the Play menu, the Clock dialog box is displayed (Figure 10-6).

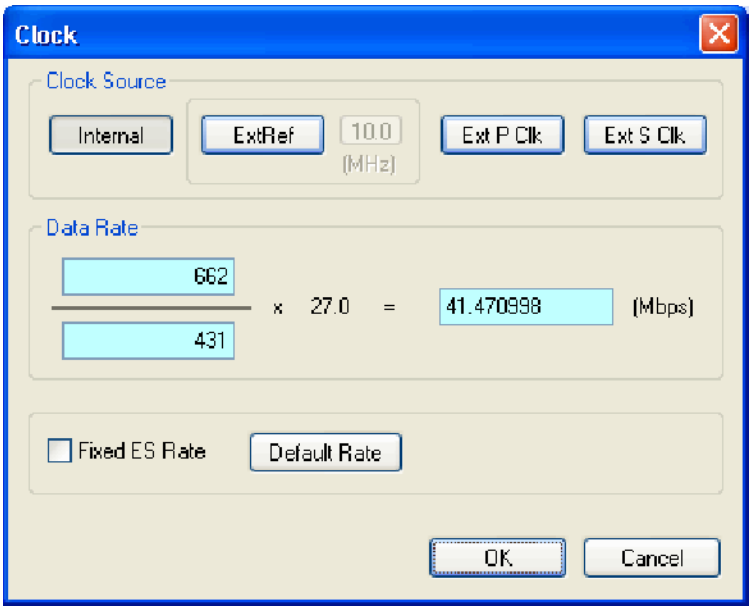
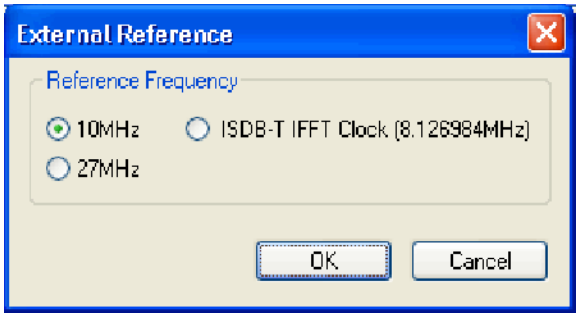


Figure 10-6: Clock Dialog Box

Clock Source: Sets which clock will be used as the reference for the stream output. You can select the desired clock source from the following settings:

Internal uses the internal clock of the MPEG Player as the clock reference.

Ext Ref allows you to input a signal on the Reference Clock Input connector for use as the clock reference. When you select the button to the right of the ExtRef box, the External Reference dialog box is displayed.



- **10 MHz**: Selects a 10 MHz signal on the Reference Clock Input connector.
- **27 MHz**: Selects a 27 MHz signal on the Reference Clock Input connector.
- **ISDB-T IFFT Clock**: Selects a signal corresponding to the IFFT sample clock rate (8.126984 MHz) on the Reference Clock Input connector.

Select the required option:

Ext P Clk (external parallel clock) allows you to input a clock signal on the Reference Clock Input connector for use as the parallel clock.

Ext S Clk (external serial clock) allows you to input a clock signal on the Reference Clock Input connector for use as the serial clock.

Data Rate: Sets the clock rate for the transport stream output. You can enter the clock rate using the following methods (the first method provides greater clock-rate precision):

Enter values into the numerator and denominator text boxes (see Figure 10-7). The MPEG Player will then calculate the clock rate based on the ratio of the numerator and denominator values.

Enter a value into the clock rate text box. The MPEG Player will then calculate the numerator and denominator text boxes based on the clock rate.

When you use the Ext P Clk or Ext S Clk mode, set the clock rate to the same value as the input clock signal. Also, when you use the Ext S Clk mode, you cannot set the value more than 32 Mbps.

Fixed ES Rate: Sets whether elementary stream rate is fixed. When it is checked, the elementary stream rate becomes constant regardless of the clock rate setting. If you fix the elementary stream rate, you cannot set the output clock rate (Data Rate) more than the data rate set when the stream file was downloaded.

When the Fixed ES Rate check box is enabled, PCR/PTS/DTS Update Method in the *Select Update Item* dialog box is set to Hardware automatically (see *Others Dialog Box* on page 10-30).

Default Rate: Displays the default clock rate and packet size and then changes the values. When you select this button, the following Default Clock dialog box appears.

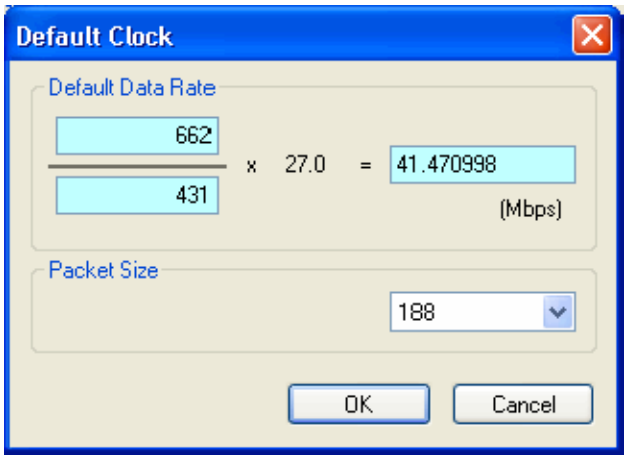


Figure 10-7: Default Clock Dialog box

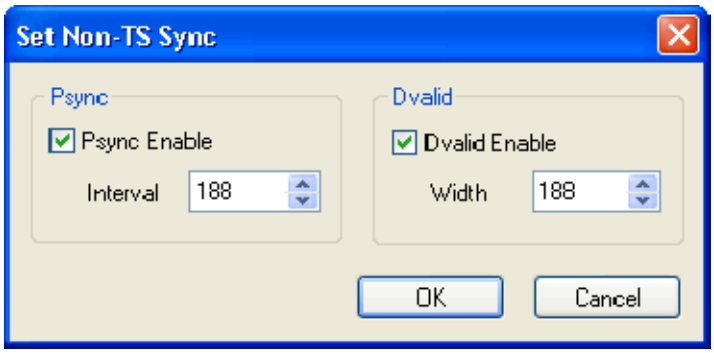
Default Data Rate: Changes the default clock rate when the selected stream file was downloaded.

Since the default clock rate is calculated based on the PCRs in the downloaded stream file, the value can be different than the original clock rate. When the elementary stream rate is fixed (refer to the Fixed ES Rate description), the instrument refers to the default clock rate. Therefore, if the default clock rate is different than the original clock rate, you need to set the value to the appropriate value. If you change the value, the clock rate value in the Data Rate dialog box is also changed.

Packet Size: Changes the default packet size when the selected stream file is downloaded. If you change the value, the Packet Size setting in the Play menu will also change.

Press the **OK** button to enable all setting changes.

Set Non-TS Sync Dialog Box. When you select **Play > Sync > Non-TS**, the Set Non-TS Sync dialog box is displayed.



- **Psync Enable**: Sets the status of the PSYNC signal output from the SPI IN/OUT connector.
  - **Interval**: Sets the output period of the PSYNC signal in the range of 16 to 255 bytes. This value needs to be set equal to or greater than the Width value in the **Dvalid** field.
- **Dvalid Enable**: Sets the status of the DVALID signal output from the SPI IN/OUT connector.
  - **Width**: Sets the data width of the DVALID signal in the range of 16 to 255 bytes.

Press the **OK** button to enable all setting changes.

PCR Intial Value Dialog Box. When you select the **PCR Initial Value...** command from the Play menu, the PCR Initial Value dialog box is displayed.

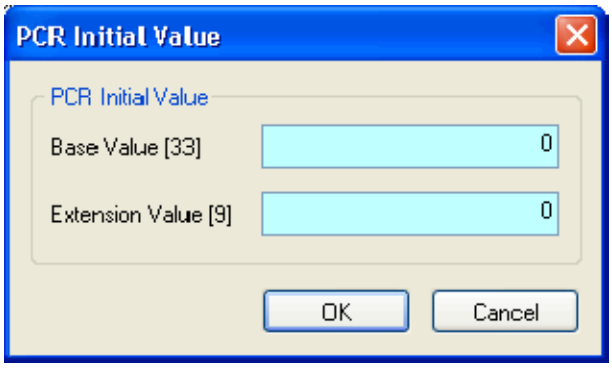


Figure 10-8: PCR Initial Value dialog box

- **Base Value**: Sets the initial value for the program_clock_reference_base value. You can set the value from 0 to 8589934591. The bracketed number represents the number of bits for the program_clock_reference_base field.
- **Extension Value**: Sets the initial value for the program_clock_reference_extension value. You can set the value from 0 to 299. The bracketed number represents the number of bits for the program_clock_reference_extension field.

Start/Stop Position Dialog Box. When you select the **Start/Stop...** command from the Play menu, the Start/Stop Position dialog box is displayed.

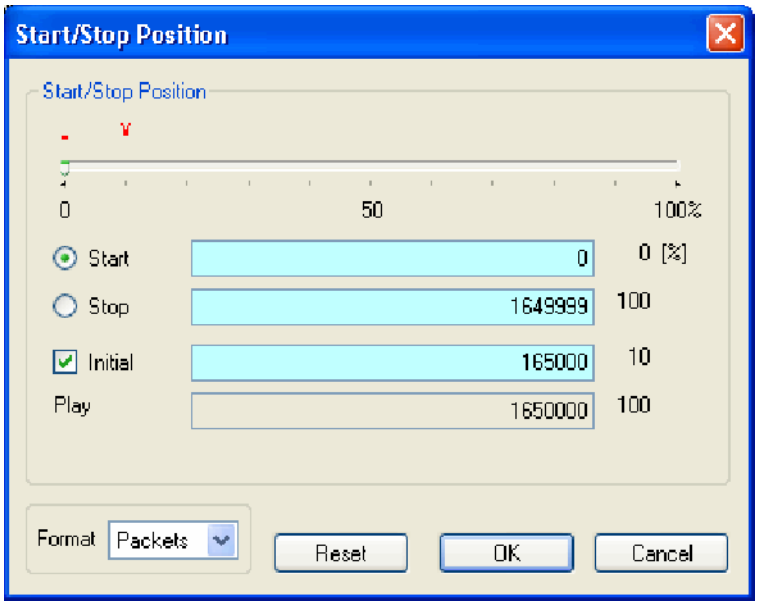


Figure 10-9: Start/Stop Position dialog box

- **Start**: Sets the start position of the stream by time (h:m:s) or the number of packets (the number of super frames for a M-TMCC file, or the number of bytes for a Non TS file). Use the **Format** list box to select the method of setting the position.
- **Stop**: Sets the stop position of the stream by time (h:m:s) or the number of packets (the number of super frames for a M-TMCC file, or the number of bytes for a Non TS file). Use the **Format** list box to select the method of setting the position.
- **Initial**: Sets the initial start position of the stream for loop output. You can set the value by time (h:m:s) or the number of packets (the number of super frames for a M-TMCC file, or the number of bytes for a Non TS file). Use the **Format** list box to select the method of setting the position.
- **Play**: Shows the actual time or number of packets (the number of super frames for a M-TMCC file, or the number of bytes for a Non TS file) that is calculated by the values of the Start and Stop text boxes.
- **Format**: Specifies the method of setting the start, stop, and initial positions of the stream. For a transport stream file, you can select Time or Packets. For a M-TMCC file, you can select Time or SF (super frame). For a Non TS file, you can select Time or Bytes.

For an ISDB-T file, the start packet is defined as the first-appearing packet including an OFDM frame start flag after the specified start position. The stop packet is defined as the packet at the front of the last-appearing packet including an OFDM frame start flag before the specified stop position. At this time, if the number of OFDM frames between the start packet and stop packet is not an even number, the packet in the last OFDM frame becomes the stop packet.

You can set the start, stop, and initial positions by using either the slider or the text boxes.

Using the Slider:

Ensure that **Packets** is selected from the **Format** drop-down list.

1. For the start and stop positions:
   a. Select the **Start** option button.
   b. Using the mouse, drag the slider to the required start position.
   c. Select the **Stop** option button.

      This moves the slider to the right end.
   d. Drag the slider to the required stop position.
   e. Select the **OK** button to enable the values.
2. For the initial start position for loop output:
   a. Enable the Initial checkbox. A red arrow appears on the slider.
   b. Drag the red arrow to the required initial start position.
   c. Select the **OK** button to enable the value.

Using the text boxes:

Ensure that **Time** is selected from the **Format** drop-down list.

1. Select the **Start** option button.
2. Enter the time in hour/minute/second format.
3. Repeat for the Stop time and the Initial Start Position time.
4. Select the **OK** button to enable the values.

To reset all of the settings to the values that were in effect when the dialog box was first displayed, select the **Reset** button, and then press the **OK** button.

Timer Play/Record Dialog Box. When you select the **Timer Play...** command from the Play menu, the Timer Play/Record dialog box is displayed.

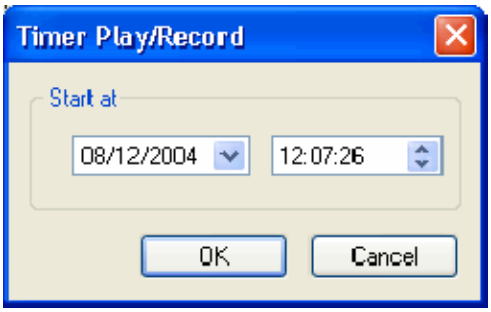


Figure 10-10: Timer Play/Record dialog box

- **Start at**: Sets the date and time when the stream output or record starts.

  When you press the **OK** button after setting the date and time, the current date and time and the set date and time are displayed. When the current date and time coincide with the set date and time, the dialog box closes and stream output or stream record starts automatically.

  If you want to cancel the operation, select the **OK** button. When the dialog box that prompts you to confirm the operation is displayed, press the **OK** button to execute the operation.

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com

Others Dialog Box. When you select the **Other**… command from the Play menu, the Others dialog box is displayed.

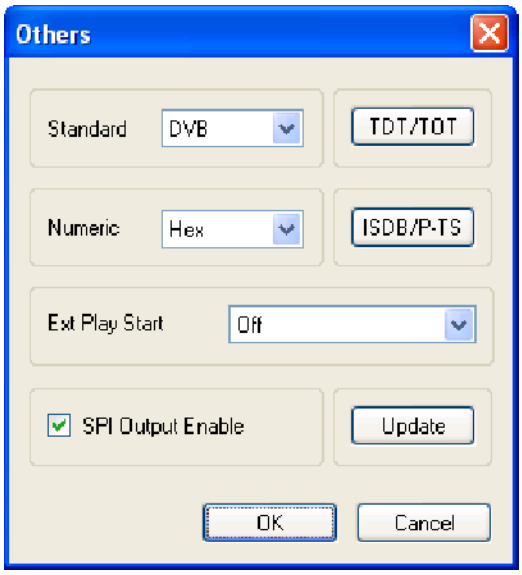
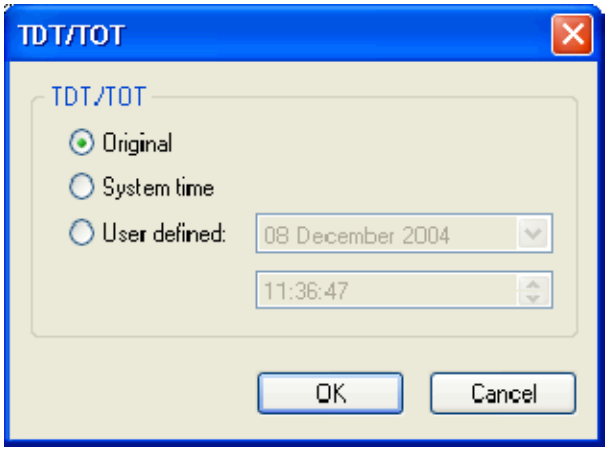


Figure 10-11: Others dialog box

- **Standard:** Sets the standard used on the hierarchy-display screen. You can select ARIB, ATSC, DVB, or MPEG2. For a transport stream (ARIB, ATSC, DVB, or MPEG2), the standard is set to the previous setting as a default. For an S-TMCC, M-TMCC, or ISDB-T transport stream, you need to select ARIB for proper display.
- **Numeric:** Sets the base value used to describe the component information in the hierarchy display. You can select Decimal, Hex, or Octal.
- **Ext Play Start**: Sets whether or not to start stream output using a trigger signal applied to the Trig In/Out connector. You can select Off, Rise, or Fall. When you select Rise, the stream output is started at the rising edge of the applied trigger signal. When you select Fall, the stream output is started at the falling edge of the applied trigger signal.
- **SPI Output Enable**: Sets whether the signal output from the SPI connector is enabled or not.
- **TDT/TOT** or **STT**: When you select this button, the following TDT/TOT dialog box appears. The button name changes which standard is selected in the Standard list box; TDT/TOT for ARIB or DVB, and STT for ATSC. Use this dialog box to change the initial date and time of the TDT (Time and Data Table), TOT (Time Offset Table), or STT (System Time Table) in the selected stream.

The button is disabled when MPEG2 is selected in the Standard list box.

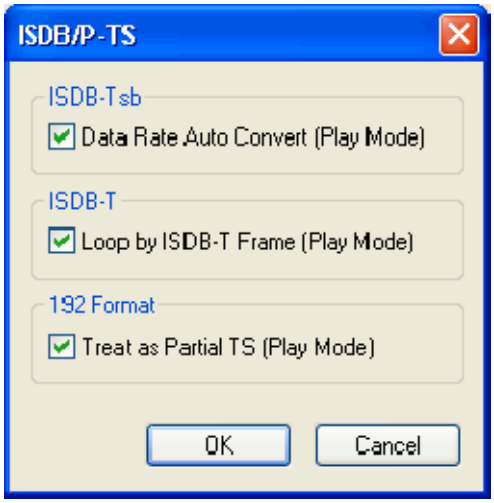


Original: Uses the original (default) value that is already defined in the selected stream.

System Time: Uses the clock/calendar of the operating system to set the initial value. When you select this option, the date and time of all the TDTs, TOTs, or STTs in the selected stream are locked to the clock/calendar of the operating system.

User Define: Uses the user-defined value to set the initial value. When you select this option, the list boxes for setting the initial date and time of the TDT, TOT, or STT are available.

- **ISDB/P-TS:** When you select this button, the following ISDB/P-TS dialog box appears.

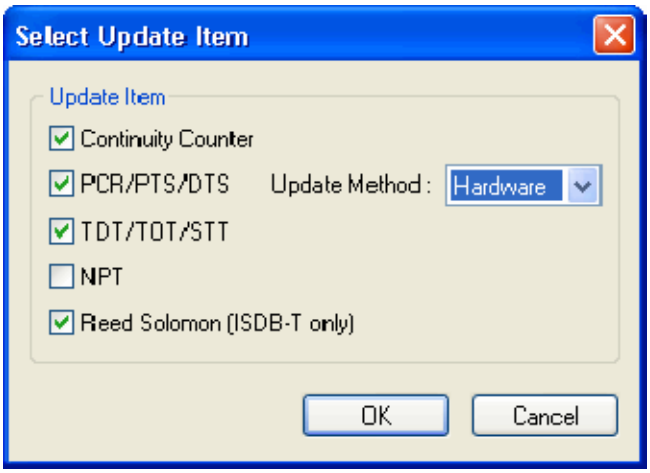


Data Rate Auto Convert (Play Mode): Sets whether to set the clock rate automatically when the ISDB-Tsb file isloaded. When this option is enabled, the clock rate is automatically set to (2048/1701) x 27 MHz and the elementary stream rate becomes constant, regardless of the Fixed ES Rate setting.

Loop by ISDB-T Frame (Play Mode): Sets whether to output the ISDB-T transport stream in OFDM frames when looped. When this option is not enabled, the ISDB-T transport stream is looped in packets.

Treat as Partial TS (Play Mode): Sets whether to output a stream file consisting of a 192-byte packet as a partial transport stream. When this option is not enabled, the stream is output in Non TS format.

- **Update**: When you select this button, the following Select Update Item dialog box appears. Use this dialog box to select which parameters in a stream are updated when looped.



Continuity Counter: Sets whether to update continuity_counter.

PCR/PTS/DTS: Sets whether to update PCR (Program Clock Reference), PTS (Presentation Time Stamp), and DTS (Decoding Time-Stamp).

Update Method: Specifies the method to update PCR/PTS/DTS. You can select Software or Hardware.

- **Hardware**: PCR/PTS/DTS are updated using the counter values of the 27 MHz clock on the output board. Since data output and PCRs are completely locked, the continuity of PCRs is maintained at the loop point even if playing long stream loops. However, timing errors occur in PTS/DTS.
- **Software**: PCR/PTS/DTS are updated by adding the actual looping time (defined by the start and stop positions) to the stream every time it is looped. There are no timing errors in PTS/DTS, however, it is difficult to maintain the continuity of PCRs at the loop point because the updating is not synchronized with the 27 MHz clock on the output board. Since this method is used to update NPT, if you enable the NPT option, Software is selected automatically.

TDT/TOT/STT: Sets whether to update TDT (Time & Data Table), TOT (Time Offset Table), and STT (System Time Table).

NPT: Sets whether to update NPT (Normal Play Time; STC_Reference field in NPT Reference Descripter defined by ISO/IEC 18318-6).

The NPT check box is only available when PCR/PTS/DTS is enabled and Update Method is set to Software. When the check box is enabled, PCR/PTS/DTS becomes enabled and Update Method is set to Software. In addition, the Fixed ES Rate option in the Clock dialog box becomes disabled.

Reed Solomon (ISDB-T only): Sets whether to update Reed-Solomon codes in an ISDB-T transport stream.

Select the **OK** button to enable all setting changes.

SPI/ASI/310M Interface Menu - Play

Table 10–10 describes the commands available in the SPI/ASI/310M menu.

Table 10-10: SPI/ASI/310M menu commands (Play screen)

Command	Description
BNC Port	Sets the format of the output signal at the ASI/SMPTE Out connector: **ASI**, **310M 8VSB**.
Through Out	Sets whether the signal supplied to the ASI/SMPTE In connector is looped back to the ASI/SMPTE Out connector when there is no recording or playout selected.
ASI Format	Selects either Byte or Packet when an ASI output is selected at the BNC Port. For Byte, valid data is output using a burst transmission mode. For Packet, valid data is output in each transport stream packet.

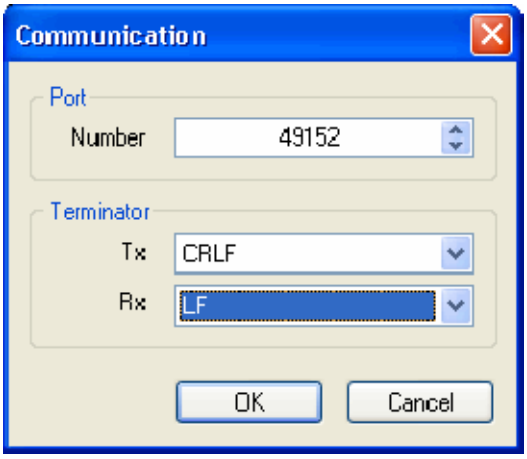
Utility Menu

Table 10–11 describes the commands in the Utility menu.

Table 10-11: Utility menu commands

Command	Description
Communication…	Sets the port number that is needed to remotely control the MPEG Player over an Ethernet network and the terminator that is used to communicate with a controller. When you select this command, the Communication dialog box appears. Refer to *Communications Dialog Box* on page 10–35 for more information.
About…	Displays general system information including the software and hardware versions. When you select this command, the About dialog box appears. Refer to *About Dialog Box* on page 10–36 for more information.

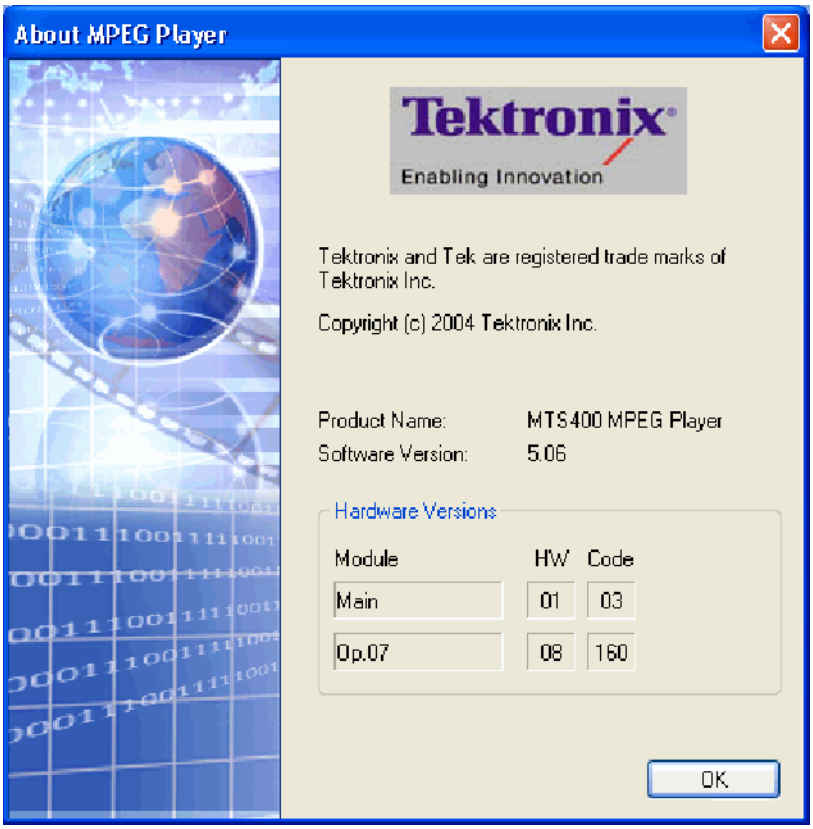
Communication Dialog Box. When you select the Communication command from the Utility menu, the **Communication**… dialog box is displayed.



- **Port Number:** Sets the port number needed to remotely control the MPEG Player over an Ethernet network. You can set the value from 1024 to 65535.
- **Terminator**
  - **Tx:** Selects the terminator that is used when the MPEG Player sends information to a controller. You can select LF (linefeed), CR (carriage return), CRLF (carriage return and linefeed), or LFCR (linefeed and carriage return).
  - **Rx:** Selects the terminator that is used when the MPEG Player receives commands from a controller. You can select LF (linefeed) or CR (carriage return).

Select the **OK** button to enable all setting changes.

About Dialog Box. When you select the **About...** command from the Utility menu, the About dialog box is displayed.



This dialog box shows the version of the MPEG Player application and hardware version of the main and installed interface modules - your versions may differ.

Menus in the Record Screen

This subsection describes the menus available in the Record screen.

File Menu

The File menu in the Record screen contains commands for setting the save mode and for saving and loading a preset file.

Table 10- 12: File menu commands (Record screen)

Component	Text
Save	Specifies the file name used when you save a stream data. When you select this command, the Save as dialog box appears. By default, the current data (yymmdd) is used as a file name.
Save Mode	Sets the save mode when you save stream data. You can select Over Write or New File. In the Over Write mode, the existing file is over written by the new file with the name specified in the Save command whenever you save a stream data. In the New File mode, a new file is created whenever you save a stream file. The file name is the following: the name specified by the Save commands + # (1,2,3,4...).
Load Preset	Loads the specified preset file (*.set). When a preset file is loaded, the current instrument settings are changed by the file's content. Refer to Preset File, page 10-49, for more information about the preset file.
Save Preset	Saves the current instrument settings as a preset file. Refer to Preset File, page 10-49, for more information about the preset file.
PLAY	Switches to the Play screen.
Exit	Quits the MPEG Player application. The MPEG Player application settings are saved.

View Menu

The View menu contains commands that control the display of the Toolbar and Status bar. The View menu in the Record screen is the same as that in the Play screen. Refer to Table 10-8 for the commands available in the View menu.

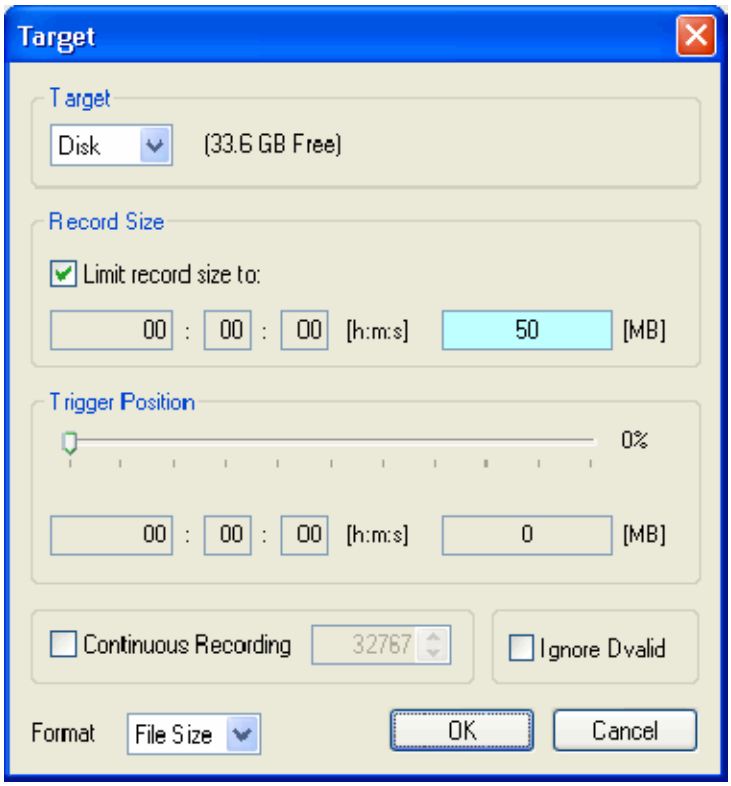
Record Menu

The Record menu contains commands for setting the input interface, record size, trigger position, and target source. Table 10–13 describes the commands in the Record menu.

Table 10-13: Record menu commands

Command	Description
Source	Sets the interface used to input a stream data. You can select SPI (DVB SPI connector) or SPI/ASI/310M (ASI/SMPTE In BNC connector).
Target…	Sets the record size, trigger position, and target source to record the input stream. When you select this command, the Target dialog box appears. Refer to *Target Dialog Box* on page 10-39 for more information.
Timer Record…	Sets the time used to record the input stream automatically. When you select this command, the Timer Play/Record dialog box appears. Refer to *Timer Play/Record Dialog Box* on page 10-29 for more information.
Other…	Sets the standard used to display the input stream and the external trigger status. When you select this command, the Others dialog box appears. Refer to *Others Dialog Box* on page 10-30 for more information.

Target Dialog Box. When you select the **Target** command from the Record menu, the Target dialog box is displayed.



- **Target**: Sets the record target - RAM or hard disk.
- **Record Size:** Sets the recording time (h:m:s) or file size (MB) to record the input stream. Use the **Format** list box to select the way to set the record size.

  The amount of free space available for the RAM or hard disk is displayed below the data size text box. You cannot set the record size beyond this value.

  Disable the **Limit record size** checkbox record the input stream to the full free space in the hard disk or RAM. When the **Limit record size** checkbox is enabled, the size (in MB) or the available recording time and data size are automatically set. In addition, When the check box is enabled, the Continuous Recording check box becomes disabled.

***NOTE**. When you set the pretrigger portion, the same free space as the record size is required.*

There is a list box in the **Record Size** field to select which record target (RAM or hard disk) is used to record the input stream.

- **Trigger Position:** Sets the trigger position used to record the input stream. You can set the trigger position by a time (h:m:s) or file size (MB).
- **Continuous Recording**: Sets whether to enable Continuous Recording. With Continuous Recording, you can record multiple stream files continuously on the hard disk.

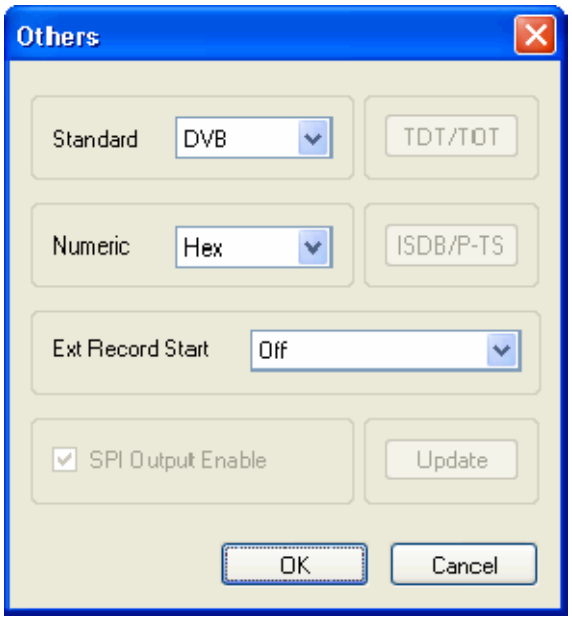
  When the check box is enabled, the spin box (at the right side of the check box) becomes available. Use the spin box to set the number of files to create before stopping Continuous Recording. After the specified number of files are created, stream capture stops automatically. You can set the value from 2 to 32767.

  When this option is selected, the Without Limit check box becomes disabled.

  Refer to *Using the Continuous Recording Feature*, beginning on page 10–50, for detailed information about Continuous Recording.
- **Ignore Dvalid**: Sets whether the MPEG Player ignores the DVALID signal from the selected interface when a stream data is acquired. When it is checked, the MPEG Player ignores the DVALID signal, and the stream data is acquired according to the internal clock signal. This option is not available for the ASI interface option.
- **Format**: Specifies the way to set the record size and trigger position. You can select Time or File Size.

Select the **OK** button to enable all the settings and to close the dialog box.

Others Dialog Box When you select the **Other...** command from the Record menu, the **Others** dialog box is displayed.



- **Standard**: Sets the standard used to display the input stream. You can select ARIB, ATSC, DVB, or MPEG2.
- **Numeric**: Sets the base value used to describe the component information in the hierarchy display. You can select Decimal, Hex, or Octal.
- **Ext Record Start**: Sets whether or not to start input stream record using a trigger signal applied to the TRIG IN connector. You can select Off, Rise, or Fall. When you select Rise, the input stream record is started at the rising edge of the applied trigger signal. When you select Fall, the input stream record is started at the falling edge of the applied trigger signal.

  When you use the external trigger signal to record the input stream, if the pretrigger portion is defined, the MPEG Player acquires pretrigger data when a valid trigger signal occurs and then waits for a trigger. When a valid trigger signal occurs again, the MPEG Player acquires posttrigger data and then creates a stream file.
- **SPI Output Enable**: This item cannot be accessed from the Record screen.

Select the **OK** button to enable all setting changes.

SPI/ASI/310M Interface Menu (SPI/ASI/310M Option) - Record

Table 10-14: SPI/ASI/310M menu command (Record screen)

Command	Description
Input Port	Selects either DVB/SPI In (**SPI**) or ASI/SMPTE In (**BNC**) connector for recording input.
BNC Port	Selects either **ASI** or **310M** (SMPTE 310) as BNC input.

Utility Menu

The Utility menu contains commands for displaying the system information such as software and hardware versions. The Utility menu in the Record screen is the same as that of the Play screen. Refer to Table 10–11 for detailed information.

Toolbar Buttons

The toolbar provides shortcut buttons for many of the most often used menu commands. Click a toolbar button to select the corresponding command.

Table 10–15 shows the toolbar buttons and their functions.

Table 10-15: Toolbar button descriptions

Icon	Name	Function
	LOAD TS file	Opens the Select File dialog box. Equivalent to the **Open** command in the File menu. This button is available when the Play screen is displayed.
	SAVE TS file	Opens the Save as dialog box. Equivalent to the **Save** command in the File menu. This button is available when the Record screen is displayed.
	Load Preset	Opens the Open dialog box. Equivalent to the **Load Preset** command in the File menu.
	Save Preset	Opens the Save as dialog box. Equivalent to the **Save Preset** command in the File menu.
	Play	Outputs the selected stream. Equivalent to the **PLAY** button on the front panel.

Table 10- 15: Toolbar button descriptions (Cont.)

Icon	Name	Function
	Record	Records the acquired stream. Equivalent to the **RECORD** button on the front panel.
	Stop	Stops the stream output or stream record. Equivalent to the **STOP** button on the front panel.
	Clock	Opens the Clock dialog box. Equivalent to the **Clock** command in the Play menu. This button is available when the Play screen is displayed.
	Target	Opens the Target dialog box. Equivalent to the **Target** command in the Record menu. This button is available when the Record screen is displayed.

Reference

This section contains information about the following MPEG Player features:

- Outputting streams
- Adding jitter to PCRs
- Using Preset files
- Using the Continuous Recording Feature
- Remote control

Interface Card (SPI/ASI/310M Option)

Refer to the MTS400 Technical Reference Manual for detailed specifications of the interface card connectors.

About the Data Output Source

When you output the selected stream data, you can select either the hard disk or the RAM as an output source. This subsection describes the operation of the MPEG Player when each output source is selected.

RAM. When you select the RAM as an output source, the MPEG Player performs the following:

- When data output rate is less than or equal to 120 Mbps, the MPEG Player outputs the first stream data while transferring the data from the hard disk to the RAM and then continuously outputs the data from the RAM using looping methods.
- When data output rate is more than 120 Mbps, the MPEG Player continuously outputs a stream data from the RAM using looping methods after the data is completely transferred from the hard disk to the RAM.

If you select the RAM as an output source, you cannot output data in excess of the RAM free space for the data output. This RAM free space is displayed on the status bar.

Hard Disk. If you select the hard disk (Disk) as an output source, the MPEG Player always outputs the selected stream data from the hard disk regardless of the data output rate. When the reading speed of the hard disk cannot overtake the data output rate, the error message “Error: Output Buffer Empty” appears.

Use the Source command in the Play menu to select the output source (see Table 10-20). You can see the currently selected output source in the status bar.

Adding Jitter to PCRs

The MPEG Player provides the capability to add jitter to PCRs (Program Clock References). Adding jitter to PCRs allows you to simulate transmission delay variations and to test the robustness of decoders under various conditions.

The jitter function adds jitter to the program_clock_reference_base value and the program_clock_reference_extension value in the adaptation field of transport stream packets. You can use this function to modulate the data values of the PCRs away from their correct values.

Adding Jitter

Perform the following procedure to add jitter to PCRs:

1. Highlight a PCR element in the hierarchy display and select **PCR Accuracy Variation0** from the right-click menu.

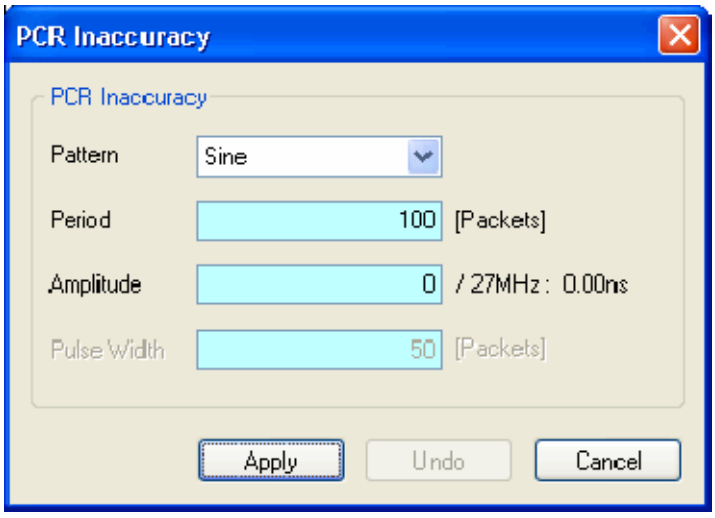


Figure 10-12: PCR Inaccuracy dialog box

2. The PCR Accuracy Variation dialog box lets you set how the parameters for how jitter will be added to the PCR.

   - **Pattern**: Selects the waveform type of the waveform used to add jitter. You can select Sine, Square, Triangle, Pulse, Sawtooth, Random, or Offset.
   - **Period:** Sets the period of the waveform used to add jitter. You can set the value from 5 to 3000 packets in 1 packet steps.
   - **Amplitude:** Sets the amplitude of the waveform used to add jitter. You can set the value from 0/27 MHz to 135000000/27 MHz (0 s to 5 s).
   - **Pulse Width:** Sets the pulse width of the waveform used to add jitter. You can set the value from 1 to (period-1) packet(s) in 1 packet steps. This Pulse Width parameter is available only when the Pattern parameter is set to Pulse.

3. After you have set the parameters, press the **Apply** button to enable the jitter function.

   Note that the PCR icon in the hierarchy display changes.

To disable the jitter function, open the PCR Inaccuracy dialog box and select the **Undo** button. Note that the PCR icon in the hierarchy display changes.

Figure 10-13 shows the relationship among the parameters and how the PCR values (program_clock_reference_base value and program_clock_reference_extension) change when Sine is selected as a jitter-pattern waveform. The PCR values vary by the value of sine waveform defined by the amplitude and period. The PCR period does not change.

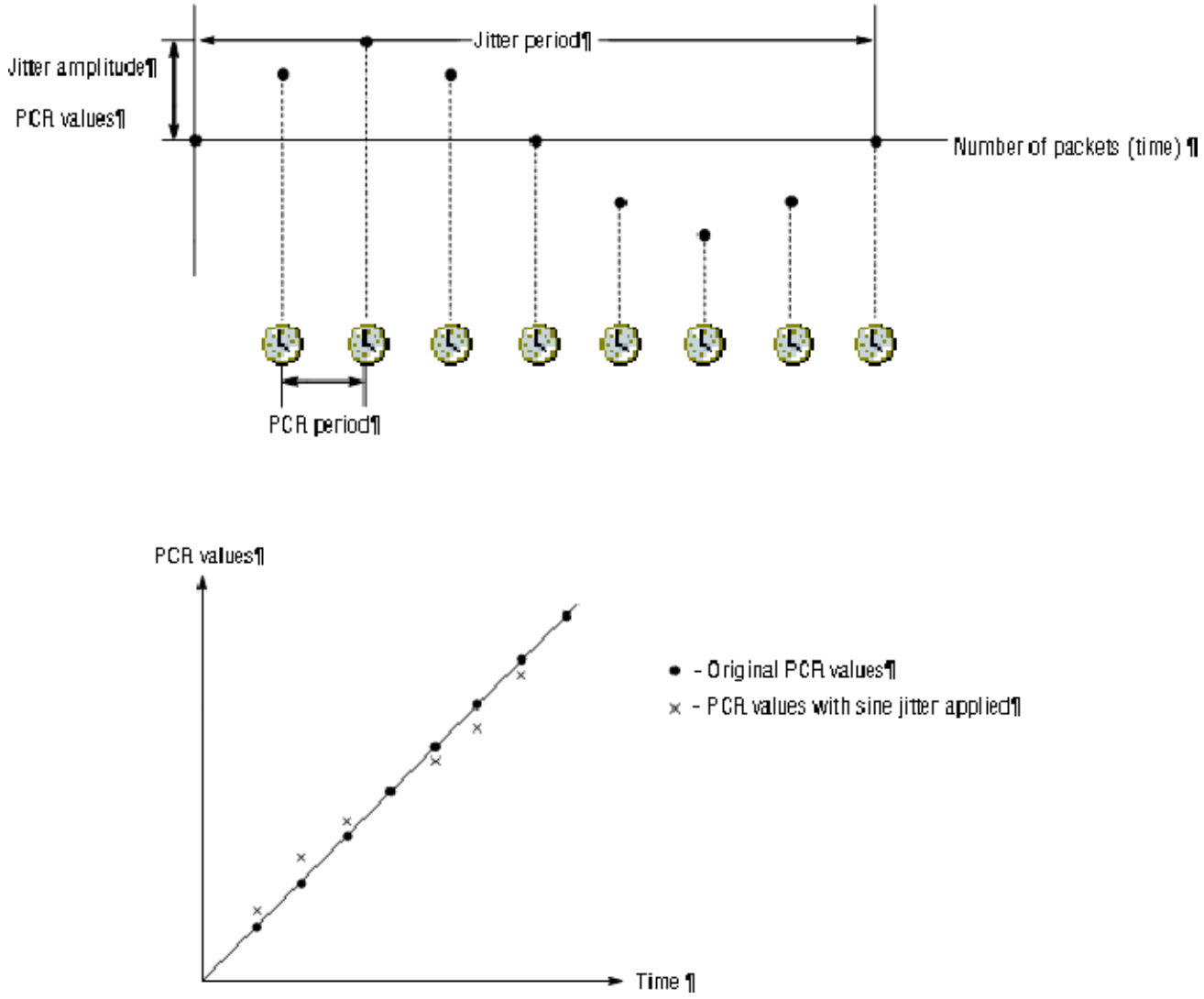


Figure 10-13: Jitter function with a sine jitter pattern applied

Using Preset Files

You can save the instrument settings that you defined as a preset file, so that you can later restore those settings.

Contents of the Preset File

Preset files can be created for the Play screen and for the Record screen.

- In the Play screen, you can save settings for stream output. All of the parameter settings available in the Play menu are saved as a preset.
- In the Record screen, you can save settings for stream record. All of the parameter settings available in the Record menu are saved as a preset.

Saving a Preset File

Use this procedure to save the current instrument settings as a preset file.

Perform the following steps to save a preset file:

1. Make the required instrument settings.
2. Select **File > Save Preset**. The **Save As** dialog box is displayed.

   In the File name text box, the following default file names are created as follows:

   - Play Screen: A two-digit serial number is added to the selected file name (for example, if the selected file name is “Test_TS”, the default file name becomes “Test_TS00”).
   - Record Screen: A two-digit serial number is added to the name “Preset”; for example “Preset01”.

   You can change the file name as required.
3. Select **OK** to save the instrument settings as a preset file.

Loading a Preset File

Perform the following steps to load an instrument setup from a preset file.

1. Select **File > Load Preset**. The **Open** dialog box is displayed.
2. Highlight the required file.
3. Press **OK** to load the preset file into the MPEG Player.

Using the Continuous Recording Feature

The Continuous Recording feature allows you to record multiple stream files continuously on the hard disk.

Continuous Recording has the following features:

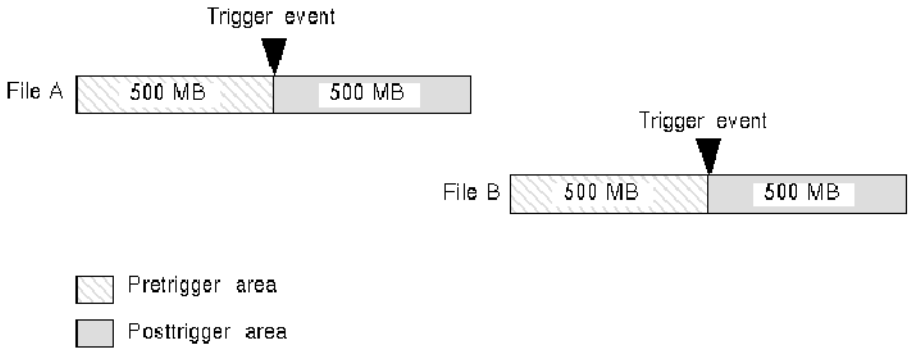
- Record multiple stream files continuously on the hard disk
- Variable file size operation
- The time stamp information of the first trigger event in a file is recorded as the updated date property of the file
- Can be used in disk recording mode

Basic Action of Continuous Recording

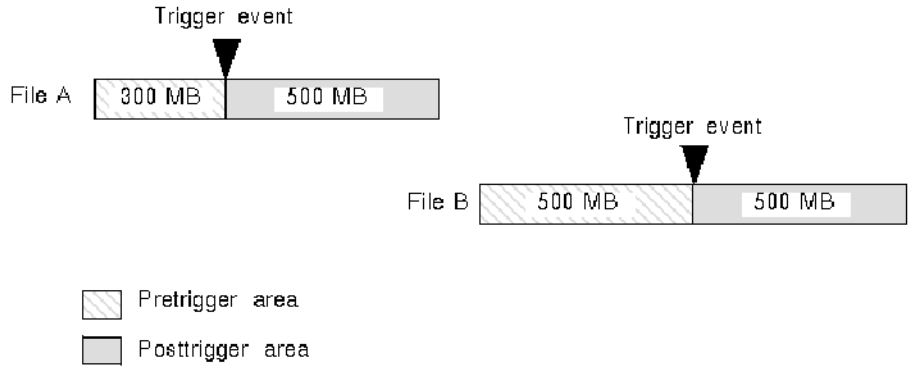
This section describes how files are recorded by the location of the trigger events in Continuous Recording.

The following explanation requires that both pretrigger and posttrigger sizes to be set to 500 MB.

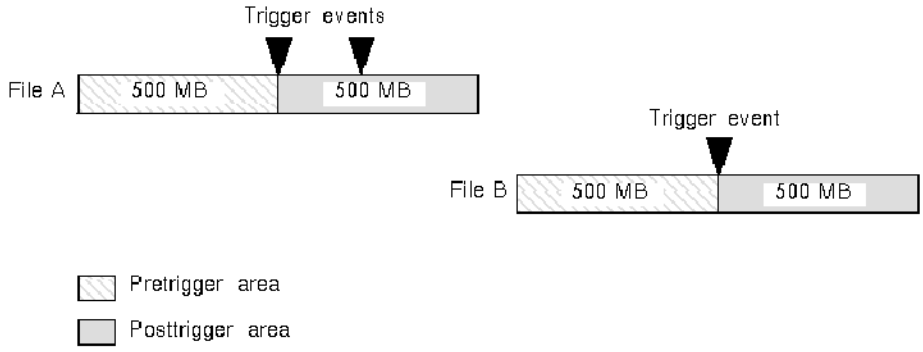
- In general, each trigger event occurs intermittently. In this case, each file contains one trigger event in the file, and the pretrigger and posttrigger areas have the specified size.



- If a trigger event occurs while the pretrigger area is filled with data, the pretrigger area becomes smaller than the specified size. However, the posttrigger area keeps the specified size. In this case, the size of the File A is smaller than the specified size.



- If the second trigger event occurs while the posttrigger area is filled with data, the second trigger event is ignored.

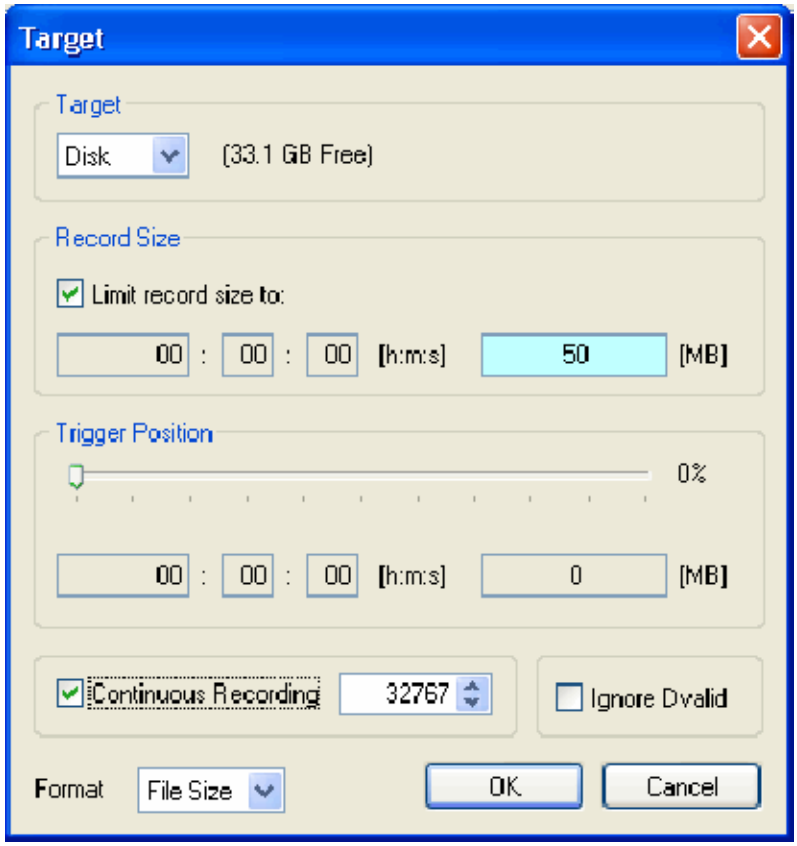


***NOTE**. If the trigger position is set to 0 (%), each file is created whenever a trigger event occurs.*

Performing Continuous Recording

Use the following procedure to perform Continuous Recording:

1. Select **File > Save...** to open the **Save** dialog box.
2. In the dialog box, select the folder where stream files are to be saved.
3. Select **Record > Target...** to open the **Target** dialog box.
4. In the dialog box, select the **Continuous Recording** check box.



5. To the right of the check box, set the number of files to be continously recorded. After the specified number of files are created, stream capture stops automatically.
6. In the **Record Size** field, set the file size to be recorded.
7. In the **Trigger Position** field, set the trigger position.

8. If you want to start recording by a trigger signal on the External Trigger connector:

   a. Select **Record > Other** to open the **Others** dialog box.

   b. Select **Rise** or **Fall** in the **Ext Record** Start field.

9. Select the Record button to start continuous recording.

While Continuous Recording is running, the total number of captured files are displayed in the file counter on the record status indicator.

When the specified number of files are created or you press the front-panel STOP button, stream capture stops.

After the stream capture stops, recording of the captured streams starts. The file counter value decreases every time recording of each file is complete. The recording starts from the last captured file. If you press the STOP button while the captured streams are recording, the recording process terminates to the file currently being recorded.

***NOTE**. The error message Drive Full appears when there is no space to record a captured file with the specified file size on the hard disk.*

Remote Commands

The MPEG Player can be controlled remotely through the 100/10 BASE-T port on the MTS400 Series rear panel.

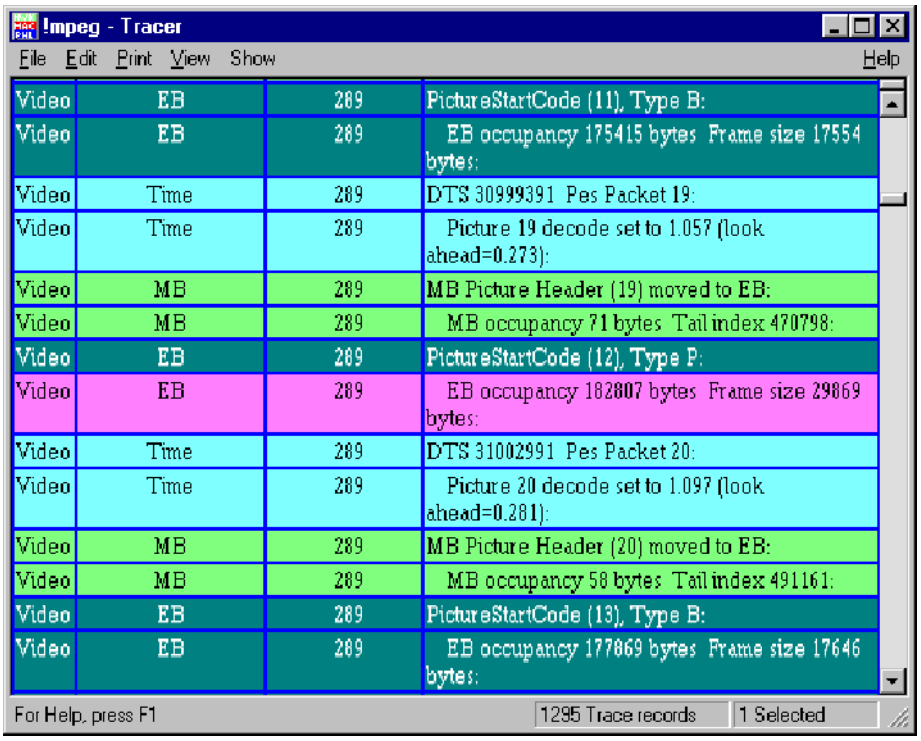
The set of remote commands is described in the MTS400 Series Programmer Manual (071-1725-xx). This is supplied as a PDF file on the MTS400 documentation (063-3857-xx) CD-ROM.

Refer to the *Getting Started Manual* (071-1505-xx) for information about how to set up the MTS400 Series for remote operation of the MPEG Player.

Tracer

Getting Started

The Tracer application is used by Tektronix software developers for analyzing message logs. It can be used in conjunction with the T-STD Buffer Analyzer application to view the message log that is produced by the Buffer Analyzer.


!mpeg - Tracer
File Edit Print View Show Help
Video EB 289 PictureStartCode (11), Type B:
Video EB 289 EB occupancy 175415 bytes Frame size 17554 bytes:
Video Time 289 DTS 30999391 Pes Packet 19:
Video Time 289 Picture 19 decode set to 1.057 (look ahead=0.273):
Video MB 289 MB Picture Header (19) moved to EB:
Video MB 289 MB occupancy 71 bytes Tail index 470798:
Video EB 289 PictureStartCode (12), Type P:
Video EB 289 EB occupancy 182807 bytes Frame size 29869 bytes:
Video Time 289 DTS 31002991 Pes Packet 20:
Video Time 289 Picture 20 decode set to 1.097 (look ahead=0.281):
Video MB 289 MB Picture Header (20) moved to EB:
Video MB 289 MB occupancy 58 bytes Tail index 491161:
Video EB 289 PictureStartCode (13), Type B:
Video EB 289 EB occupancy 177869 bytes Frame size 17646 bytes:
For Help, press F1
1295 Trace records
1 Selected

Important Information about Tracer

NOTE. *Tracer is not a component of the MPEG Test System Product Family and is supplied, free of charge, for use on an "as is" basis. It is included for use where an in-depth analysis of how Buffer Analyzer processes a stream may be helpful.*

Please send any comments on the use and value of Tracer to Tektronix. If the facilities in Tracer are found to be of value, they may be incorporated into Buffer Analyzer or another application in a later release.

Setting Up Tracer and Buffer Analyzer

When the software components of a MPEG Test System product that includes the Buffer Analyzer are installed:

- Buffer Analyzer is configured with the detail message log output disabled.
- Tracer is set up ready for use. A menu option is created under the Tektronix Start menu. By default, there is no desktop shortcut set up for Tracer.

The command line of Buffer Analyzer must be configured to output the detail message log in the format for the Tracer utility. Processing will be slower when Buffer Analyzer is operating in the detail message configuration.

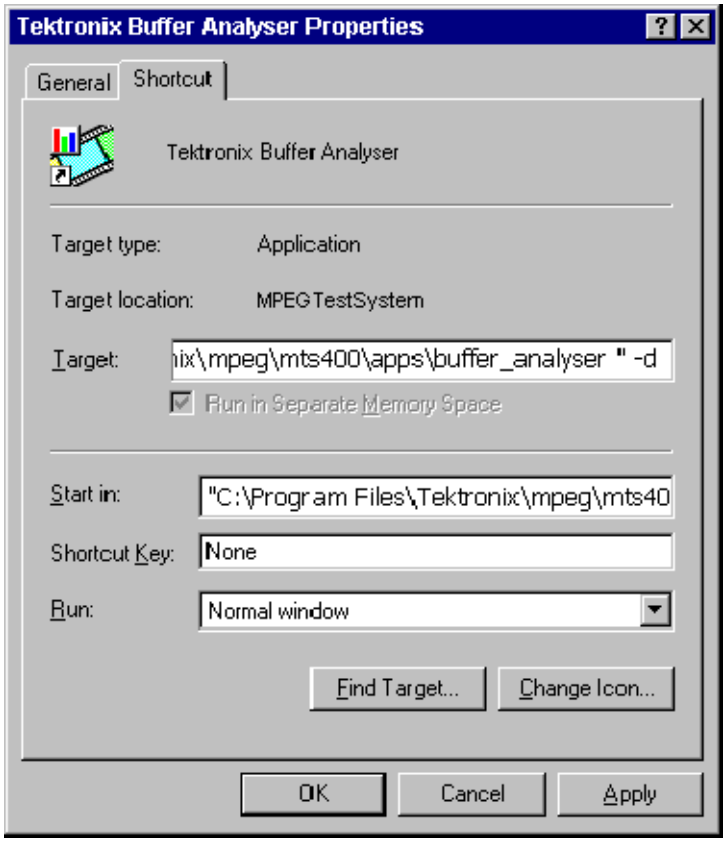
Enabling Detail Message Log

To enable detail message logging, the properties of an existing shortcut for Buffer Analyzer must be changed or a new shortcut must be created. A shortcut is any program option in the start menu or program icon on the desktop.

To enable logging, follow these steps:

1. Create a new shortcut or select an existing shortcut. Open the properties dialog for that shortcut.)Refer to your Windows user manual or online help for detailed instructions if required.)
2. By default, the dialog box opens with the General tab on top. Select the Shortcut Tab.

The dialog box should now look something like this:



For a standard installation of the MPEG Test System software, the current command line will look like this:

```
"C:\Program
Files\Tektronix\mpeg\mts400\apps\buffer_analyser.exe"
```

Add the “-d” option to the end of the line after the quotes and separated from them by a single space:

```
"C:\Program Files\Tektronix\mpeg\mts400\apps\buffer_analyser
" -d
```

Select the OK button to commit the change and close the dialog box.

If a desktop shortcut is required, an !mpeg argument must be appended to the command line so that it looks like this:

```
"C:\Program
Files\Tektronix\mpeg\mts400\apps\utilities\tracer.exe" !mpeg
```

Starting Tracer

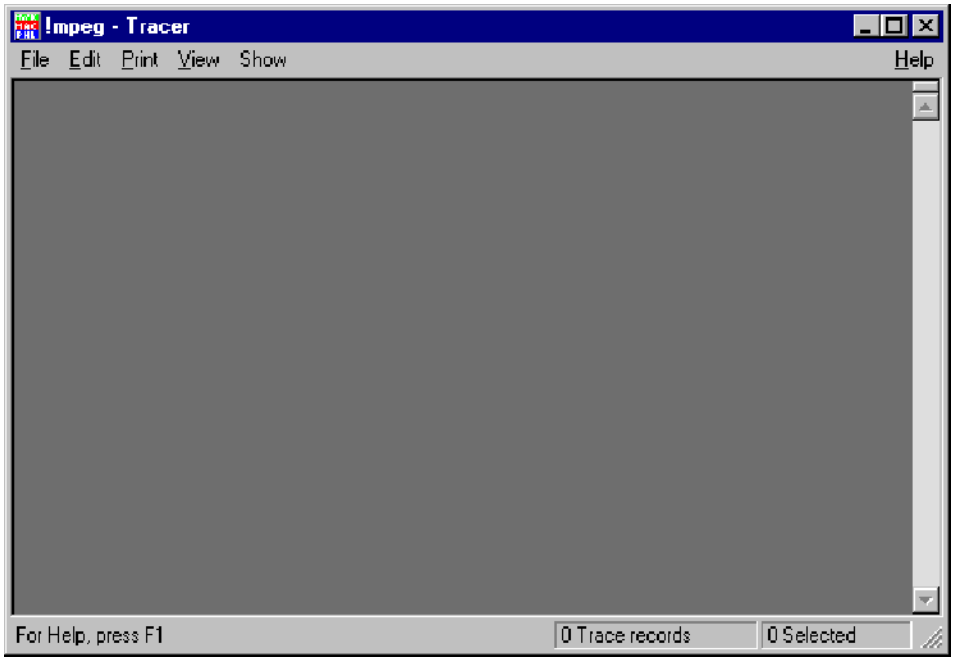
Tracer can be started by selecting the Tracer option from the Tektronix Utilities submenu of the **Start > Programs** menu. Alternatively, double click a Tracer desktop shortcut if one has been created.

***NOTE**. Only run one copy of Tracer and one of Buffer Analyzer when using the Tracer facilities. Buffer Analyzer writes messages to a circular buffer from which Tracer captures them.*

To ensure that no records are missed, start Tracer before Buffer Analyzer opens an MPEG file.

User Interface

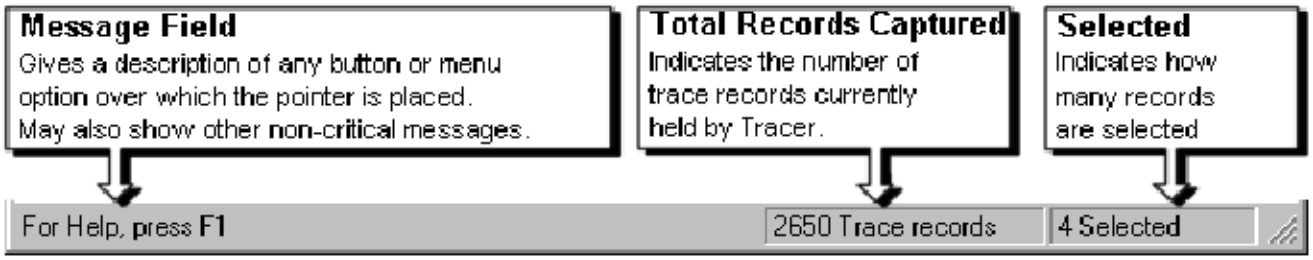
Once the program has started and is ready for use, it will open a Main Window. When the program starts, the main window looks like this:



Tracer displays the detail message log in the main window. It has a Status bar at the bottom of the window and a scroll bar on the right side.

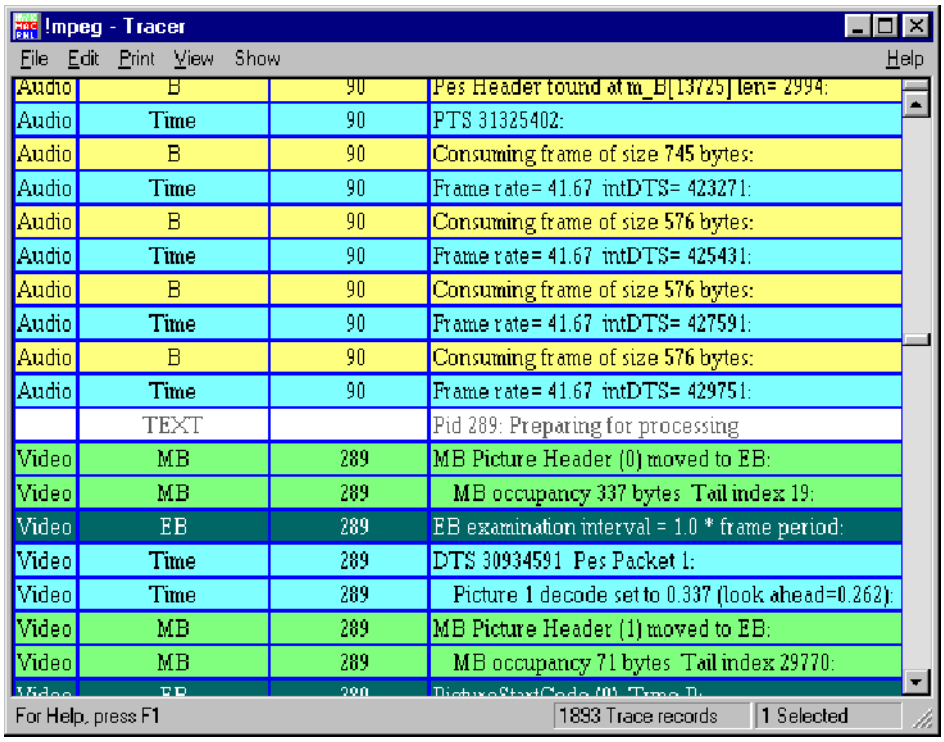
Status Bar

The Status Bar may be hidden from view, but if it is visible it is always at the bottom of the main window. It displays the following information about the program status:


Message Field
Gives a description of any button or menu option over which the pointer is placed. May also show other non-critical messages.
Total Records Captured
Indicates the number of trace records currently held by Tracer.
Selected
Indicates how many records are selected
For Help, press F1
2650 Trace records
4 Selected

Detail Message Records

These are displayed in the main window in the form of a table. Each record is represented by a single row of the table.


Impeg - Tracer
File Edit Print View Show Help
Audio B 90 Pes Header found at m_B[13725] len= 2994:
Audio Time 90 PTS 31325402:
Audio B 90 Consuming frame of size 745 bytes:
Audio Time 90 Frame rate= 41.67 intDTS= 423271:
Audio B 90 Consuming frame of size 576 bytes:
Audio Time 90 Frame rate= 41.67 intDTS= 425431:
Audio B 90 Consuming frame of size 576 bytes:
Audio Time 90 Frame rate= 41.67 intDTS= 427591:
Audio B 90 Consuming frame of size 576 bytes:
Audio Time 90 Frame rate= 41.67 intDTS= 429751:
TEXT Pid 289: Preparing for processing
Video MB 289 MB Picture Header (0) moved to EB:
Video MB 289 MB occupancy 337 bytes Tail index 19:
Video EB 289 EB examination interval = 1.0 * frame period:
Video Time 289 DTS 30934591 Pes Packet 1:
Video Time 289 Picture 1 decode set to 0.337 (look ahead=0.262):
Video MB 289 MB Picture Header (1) moved to EB:
Video MB 289 MB occupancy 71 bytes Tail index 29770:
For Help, press F1
1893 Trace records
1 Selected

The example shows a log in which a PID (PID 90) carrying audio was analyzed and then another (PID 289) carrying video was analyzed. A general TEXT message is output at the start of processing for each PID.

Options to select which types of message are displayed are available from the Show menu.

To move forwards and back through the log use: the scroll bar on the right of the window, the Page Up, Page Down, Cursor Up Arrow and Cursor Down Keys.

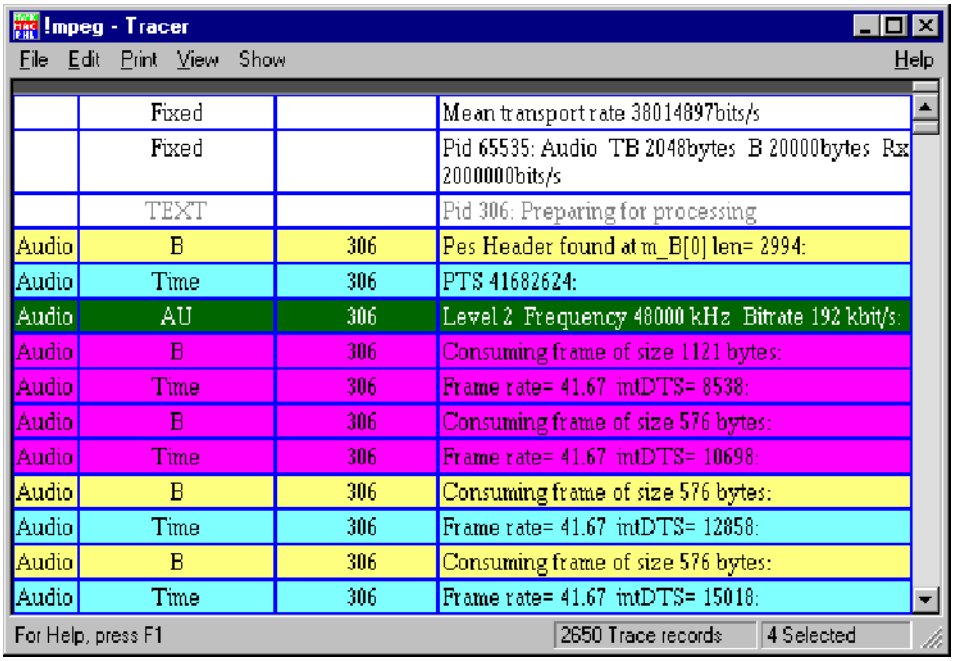
NOTE. *If more than one PID is processed concurrently by Buffer Analyzer, the records will be interleaved in the Tracer display. Unless this interleaving is required, processing one PID at a time will make it easier to follow the messages for each stream.*

Selecting Records

Records may be selected for printing, copying, deleting, and other Edit menu operations. To do this, they must first be selected.

A single record can be selected by clicking on it. To select a contiguous range of streams: click on the first record to be selected and then hold the Shift or ñ key down and click on the last required record. Alternatively, click on the first record, hold the left mouse button down, and drag the pointer to the last record.

Selected records are repainted in the highlight color scheme. By default, this is black text on a magenta background. For example:

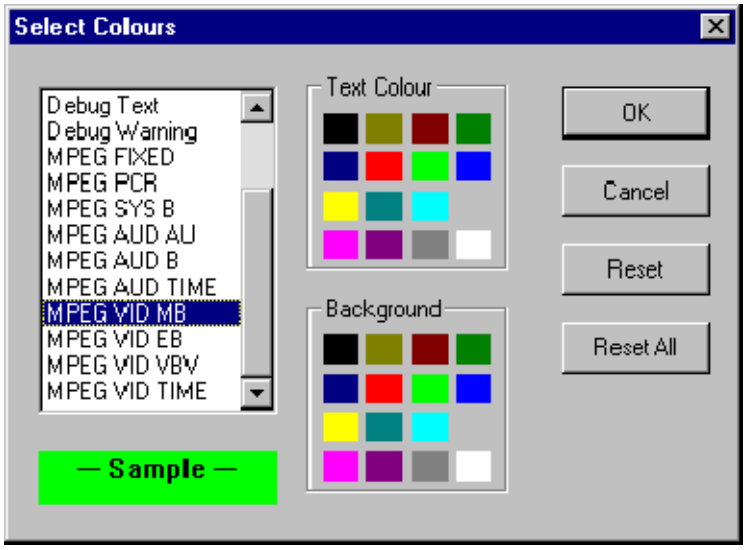

!mpeg - Tracer
File Edit Print View Show Help
Fixed Mean transport rate 38014897bits/s
Fixed Pid 65535: Audio TB 2048bytes B 20000bytes Rx 2000000bits/s
TEXT Pid 306: Preparing for processing
Audio B 306 Pes Header found at m_B[0] len= 2994:
Audio Time 306 PTS 41682624:
Audio AU 306 Level 2 Frequency 48000 kHz Bitrate 192 kbit/s:
Audio B 306 Consuming frame of size 1121 bytes:
Audio Time 306 Frame rate= 41.67 intDTS= 8538:
Audio B 306 Consuming frame of size 576 bytes:
Audio Time 306 Frame rate= 41.67 intDTS= 10698:
Audio B 306 Consuming frame of size 576 bytes:
Audio Time 306 Frame rate= 41.67 intDTS= 12858:
Audio B 306 Consuming frame of size 576 bytes:
Audio Time 306 Frame rate= 41.67 intDTS= 15018:
For Help, press F1
2650 Trace records
4 Selected

Unless they are deleted, the selected records stay selected until a new selection is made. This does not affect the operation of the other facilities in Tracer.

Color Schemes

The color scheme for each message type and for highlighting selections can be changed using the Select Color dialog.

To modify the color schemes, select the Colors option from the View Menu. This opens the Select Colors dialog box:



Select the message type to be changed from the list box on the left. The current color scheme will be displayed in the Sample underneath the list box. Click on the swatch (colored square) for the required color in the Text Color and Background panels.

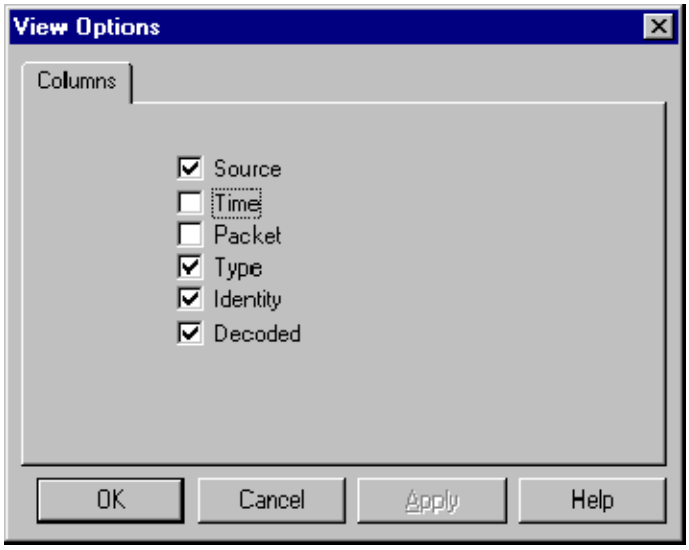
Repeat the procedure for each message type that is to be changed. Then select OK.

The Reset button restores the selected message type to the default color scheme. The Reset All button restores all of the color schemes to their defaults.

Column Options

The Options… option under the View menu opens the dialog to select which columns of information are displayed in the table.

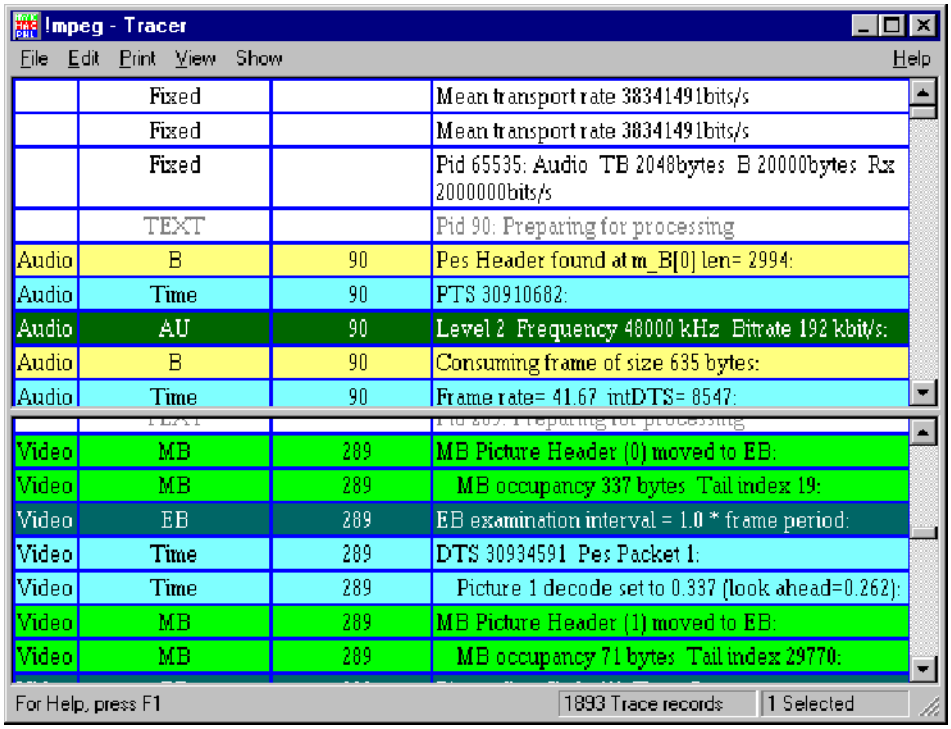
To modify the color schemes, select the Colors option from the View Menu. This opens the View Options dialog box:



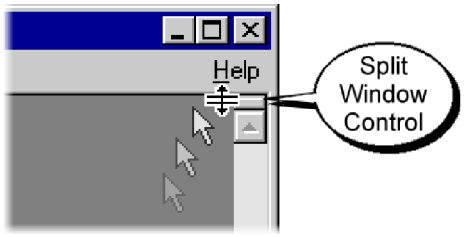
A column is shown for each option that is enabled. These are indicated by a check mark. Clicking on an option toggles it between being shown or hidden.

Split Window Operation

The main window may be split into two views, each of which can be scrolled independently. For example, here is a split view showing the start of processing of an Audio stream in the upper view and the start of processing for a Video stream in the lower view:


Impeg - Tracer
File Edit Print View Show Help
Fixed Mean transport rate 38341491bits/s
Fixed Mean transport rate 38341491bits/s
Fixed Pid 65535: Audio TB 2048bytes B 20000bytes Rx 2000000bits/s
TEXT Pid 90: Preparing for processing
Audio B 90 Pes Header found at m_B[0] len= 2994:
Audio Time 90 PTS 30910682:
Audio AU 90 Level 2 Frequency 48000 kHz Bitrate 192 kbit/s:
Audio B 90 Consuming frame of size 635 bytes:
Audio Time 90 Frame rate= 41.67 intDTS= 8547:
Video MB 289 MB Picture Header (0) moved to EB:
Video MB 289 MB occupancy 337 bytes Tail index 19:
Video EB 289 EB examination interval = 1.0 * frame period:
Video Time 289 DTS 30934591 Pes Packet 1:
Video Time 289 Picture 1 decode set to 0.337 (look ahead=0.262):
Video MB 289 MB Picture Header (1) moved to EB:
Video MB 289 MB occupancy 71 bytes Tail index 29770:
For Help, press F1
1893 Trace records
1 Selected

To split the window, move the mouse pointer over the small horizontal bar at the top of the scroll bar. This is the split window control. As the mouse pointer moves over the control, it will change shape to show that it is in position to move the control.



Hold down the left mouse button and drag the control down to split the window. Release the mouse button when the views are a suitable size. To revert to a single view, drag the split window control back to the top of the scroll bar.

Menus and Controls

The following pages describe all of the menu options. Since many of the options are context sensitive, they will be available only when their function is appropriate for the selected window or display element. When a menu option is not available, the menu option is grayed out.

File Menu Options

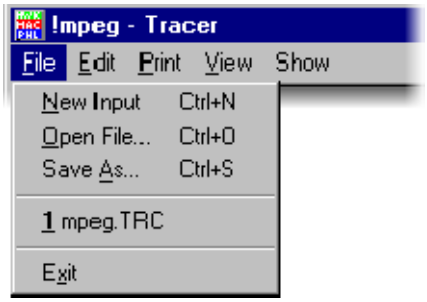


Table 11-1: File menu options

Command	Function
New Input	Not applicable with Buffer Analyzer.
Open File…	Opens a previously saved file of detail message log records. Buffer Analyzer does not need to be running to use this facility.
Save As…	Saves the records currently held in Tracer to a file.
1 <filename>	Lists most recently used files of detail message log records, up to a maximum of four files.
Exit	Discards any unsaved records and terminates execution of the program.

Edit Menu Options

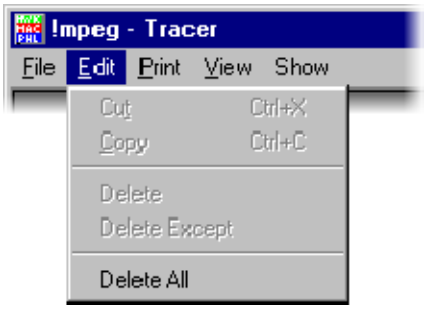


Table 11-2: Edit menu options

Command	Function
Cut	Moves the currently selected records from the main window to the clipboard.
Copy	Copies the contents of the currently selected records to the clipboard. They are not removed from the main window.
Delete	Deletes the selected records from the main window.
Delete Except	Deletes all records except those selected from the main window.
Delete All	Deletes all records.

Print Menu Options

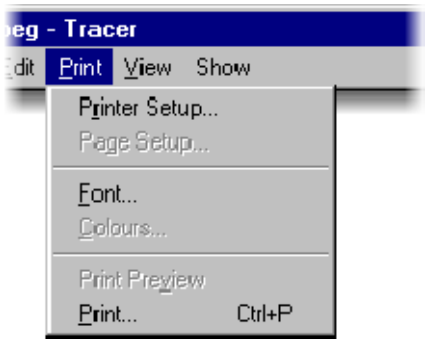


Table 11-3: Print menu options

Command	Function
Printer Setup…	Selects printer and configuration.
Page Setup…	Not available with Buffer Analyzer.
Font…	Selects which font is used for printing text.
Colors…	Not available with Buffer Analyzer.
Print Preview	Not available with Buffer Analyzer.
Print…	Prints all or just the current selection of records.

View Menu Options

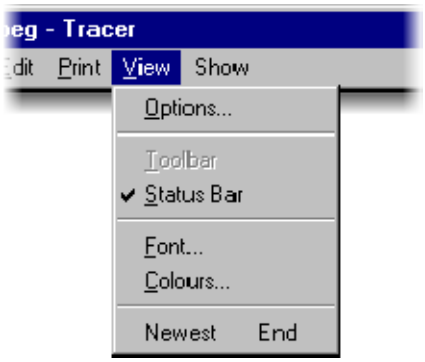


Table 11-4: View menu options

Command	Function
Options…	Opens the options dialog for selecting what columns of information to display.
Toolbar	Not available.
Status Bar	Shows or hides the Status Bar.
Font…	Selects which font is used for displaying the text of detail message log records.
Colors…	Selects background and text colors to be used to display each type of message.
Newest	Displays the newest record.

Show Menu Options

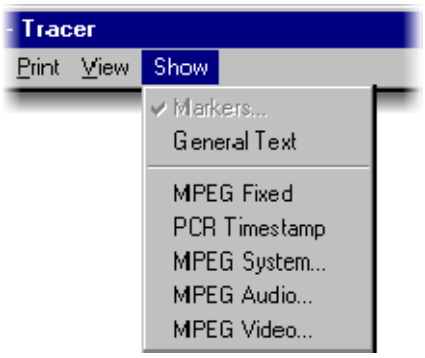


Table 11-5: Show menu options

Command	Function
Markers	Showing markers is permanently selected for using Tracer with the Buffer Analyzer.
General Text	Show or hide general messages. For example, messages indicating start of processing for a particular PID.
MPEG Fixed	Show or hide MPEG-2 information such as transport rates and buffer sizes.
PCR Timestamp	Show or hide messages about PCRs and associated instantaneous transport rates.
MPEG System…	Select which types of MPEG-2 system messages to show.
MPEG Audio…	Select which types of MPEG-2 audio messages to show.
MPEG Video…	Select which types of MPEG-2 video messages to show.

Help Menu Options

Table 11-6: Help menu options

Command	Function
Index	Online help is not available when using Tracer with Buffer Analyzer.
About Tracer...	Displays the program version number.

Make Seamless Wizard

Make Seamless Wizard

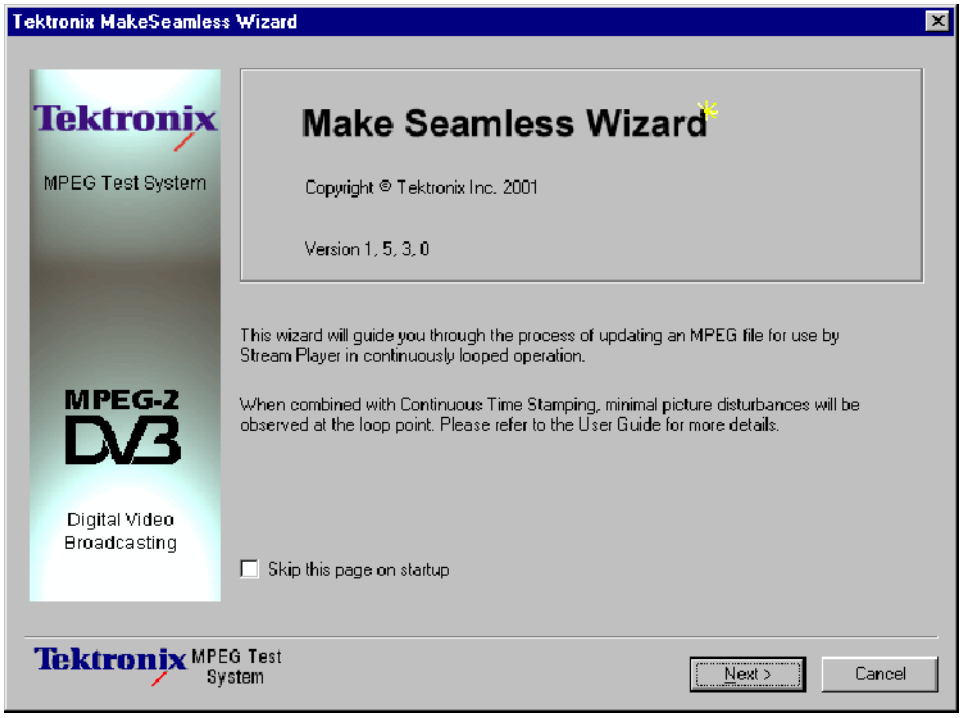
This wizard guides you through the process of creating an MPEG-2 file for use by Stream Player in continuously looped operation.

The wizard is largely self-explanatory. The notes in this section of the manual provide a slightly more detailed explanation of the wizard and the necessary user responses.

Starting the Wizard

To start the wizard, select the Make Seamless option from the Start menu. Alternatively, double-click on the Make Seamless shortcut on the desktop.

The opening window is displayed:


Tektronix MakeSeamless Wizard
Tektronix
MPEG Test System
Make Seamless Wizard
Copyright © Tektronix Inc. 2001
Version 1, 5, 3, 0
This wizard will guide you through the process of updating an MPEG file for use by Stream Player in continuously looped operation.
When combined with Continuous Time Stamping, minimal picture disturbances will be observed at the loop point. Please refer to the User Guide for more details.
MPEG-2
DVB
Digital Video Broadcasting
Skip this page on startup
Tektronix MPEG Test System
Next >
Cancel

This first page gives a short explanation of the wizard's activities and offers the opportunity to skip the page in the future.

Select Next to move to the next screen and specify the input file.

Progress and Information Log

The Progress and Information log displays messages during the operation of the wizard. Three types of message can be displayed:

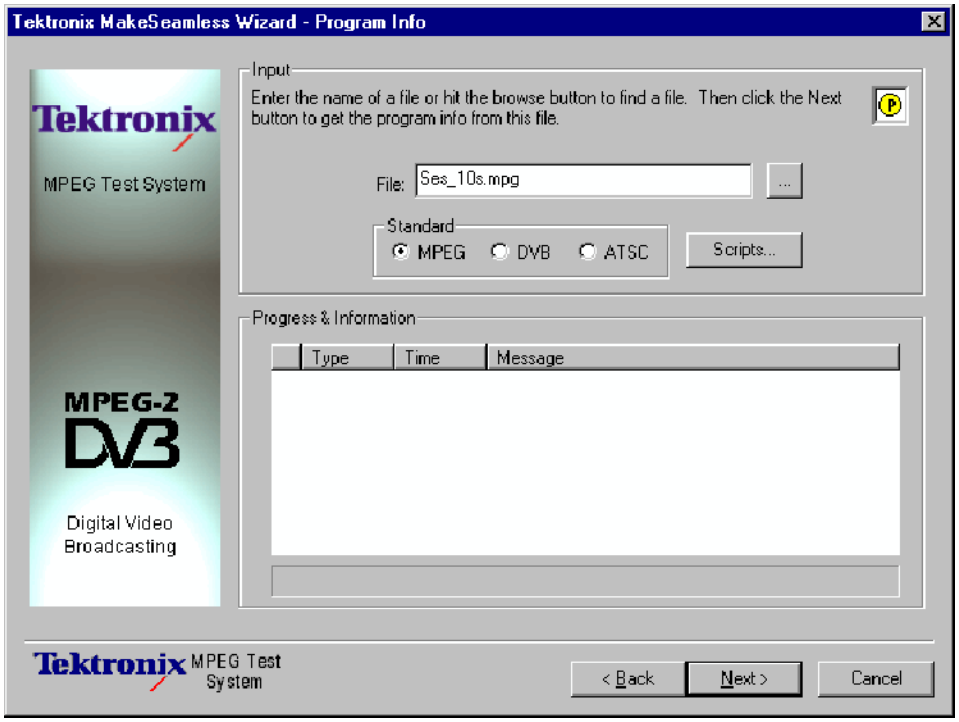
INFO	General processing information.
WARNING	Messages which may mean that the output stream will contain errors.
ERROR	Messages indicating catastrophic information which will cause the wizard to disable the Next button and prevent further progress.

An icon is displayed in the top right corner of the window and as a prefix to any messages displayed in the Progress & Information log. The icons are used to indicate the current processing phase of the Make Seamless Wizard:

Program Ⓟ Analysis Ⓐ Multiplex Ⓜ

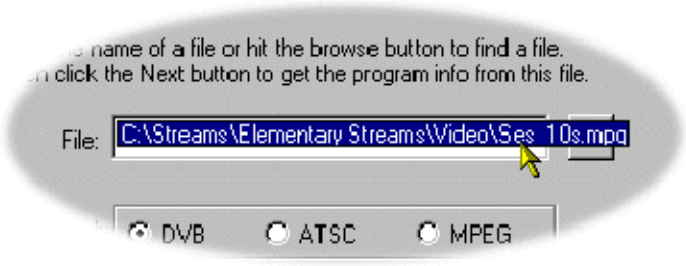
Selecting an Input File

The first action is to identify the input or source transport stream.



Enter the filename in the File: field. The browse button (…) can be used to open a standard Windows Open dialog box and locate files.

***NOTE**. Only the filename will be shown, but by resting the cursor over the filename, the full path is shown for a short time in a tooltip.*


name of a file or hit the browse button to find a file.
click the Next button to get the program info from this file.
File:
C:\Streams\Elementary Streams\Video\Ses_10s.mpg
DVB
ATSC
MPEG

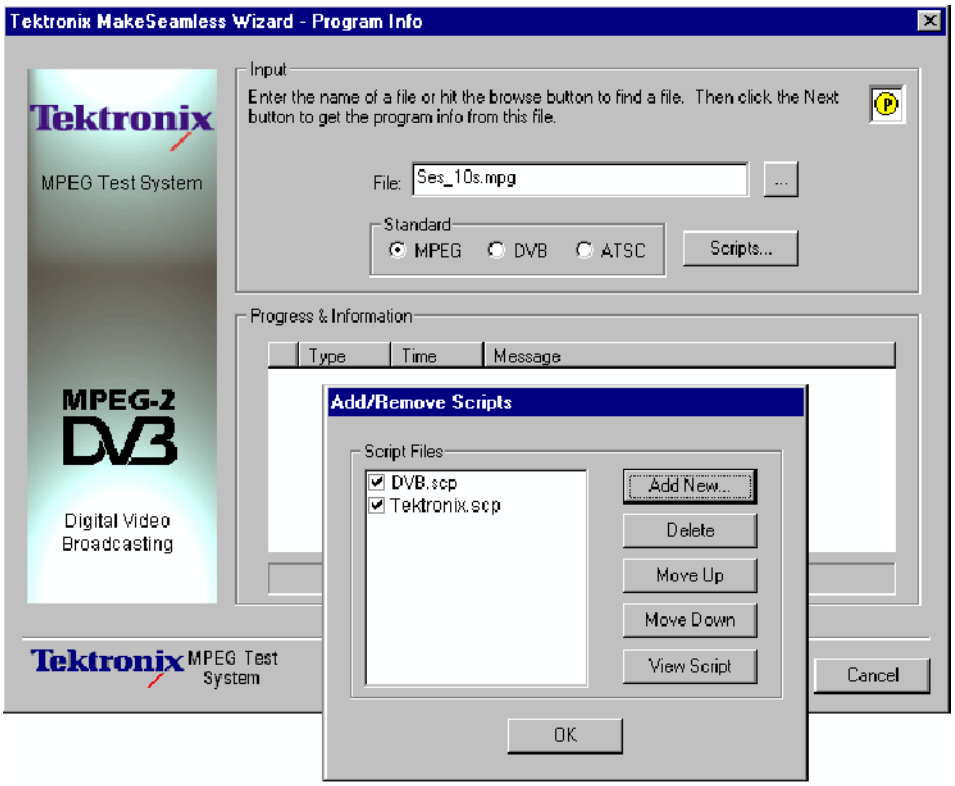
SI Scripts

Customized SI scripts are available to the Make Seamless Wizard to enable custom SI table and descriptor data to be processed successfully. Basic processing of the Standards does not require additional scripts.

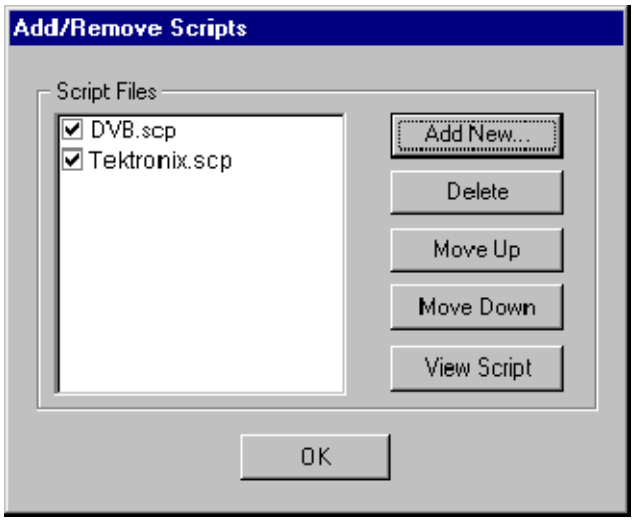
If a suitably configured script is selected and enabled before a stream is analyzed, custom data will be analyzed when the stream is opened. If the script is not selected or enabled, the stream will not fail to be analyzed, but any custom data will either be ignored or reported as an error in the stream configuration.

(The underlying principles of scripting are described in the Custom SI Scripting section of this user manual.)

Handling Script Files. To handle SI Scripts, select the general Standard required by enabling the appropriate radio button and select the **Scripts…** button.



The Script dialog box displays the scripts currently associated with each standard and allows them to be added, removed, viewed, and manipulated.



There is, in effect, one Script File list associated with each mode; script files can be listed in one or more Script file lists. Script files are designated as MPEG, DVB or ATSC when they are added to the Script File list. Each mode will display only those script files associated with that mode. Further script files can be added as required using the **Add New…** button.

Note that a script file will not be used for analysis until:

- It is added to the Script File list in the appropriate mode.
- It is enabled (displays a check mark in the Script File list).

Adding a Script File.

1. In the Script dialog box, select the Mode to which the script is to be added; for example, DVB.
2. Select the **Add New…** button. A standard Windows file selection dialog box is opened. The default file extension is .scp. Select the required file.

Note that the selected script file is now listed in the script file list and is enabled; it will be used for any analysis.

Enabling a Script File. Select the check mark adjacent to the required script file to enable the file for analysis.

Moving a Script File. Script files are applied to analysis in the order that they are listed; in some circumstances this may be important. To move a file in a list, highlight the file name and select the Move Up or Move Down button as required. Each press of the button will move the file up or down one place in the list until it reaches the top or the bottom.

Viewing a Script File. Script files can be viewed and edited in a text editor (provided that the scp extension has been associated correctly in Windows Explorer). To edit a script, highlight the script name and select View. This will open the script in Notepad or its equivalent. The required edits can then be made and the script saved.

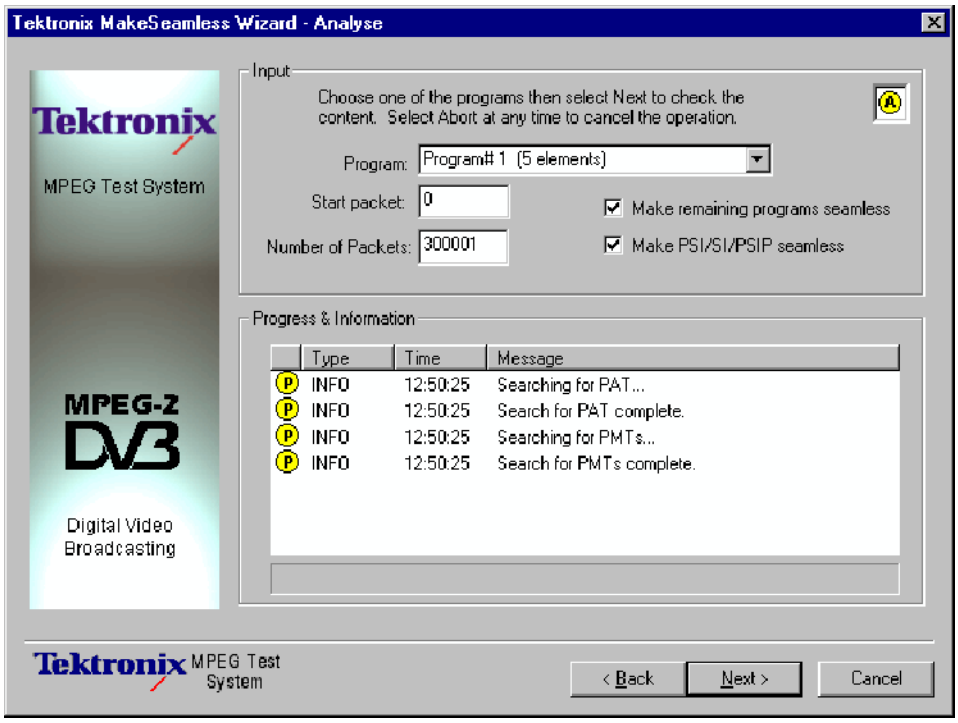
When the filename is satisfactory and any scripting actions have been performed, select Next to analyze the file. Progress is indicated by the progress bar and the appearance of messages in the Progress & Information log.

Select a Program to Make Seamless

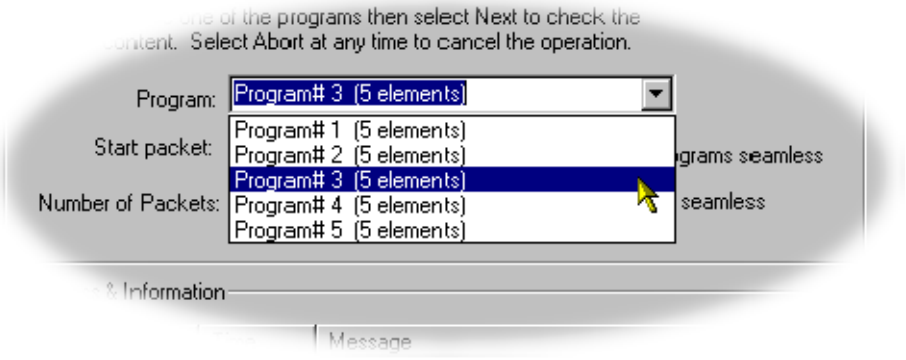
During the input file's analysis the selected transport stream is analyzed to determine it's program content. If analysis is unsuccessful in determining program content, the stream will not be opened and an appropriate message will be displayed in the Progress & Information log.

Each program found is displayed in the drop-down list (**Program:**) accompanied by an indication of the number of program elements (video, audio, etc.).

At this stage a priority program must be selected in order for it to be analyzed and tested for suitability for the "make seamless" treatment.



Program: Highlight the required program from the drop-down list.



Start packet: This value determines from where the primary program is to be analyzed. Indicates the offset from the original transport stream start point to start looking for a loop start point.

Number of Packets: Initially, this value is set to the total number of packets in the transport stream. It indicates the maximum number of packets (up to the end of the stream) from the Start packet point that may be included in the loop.

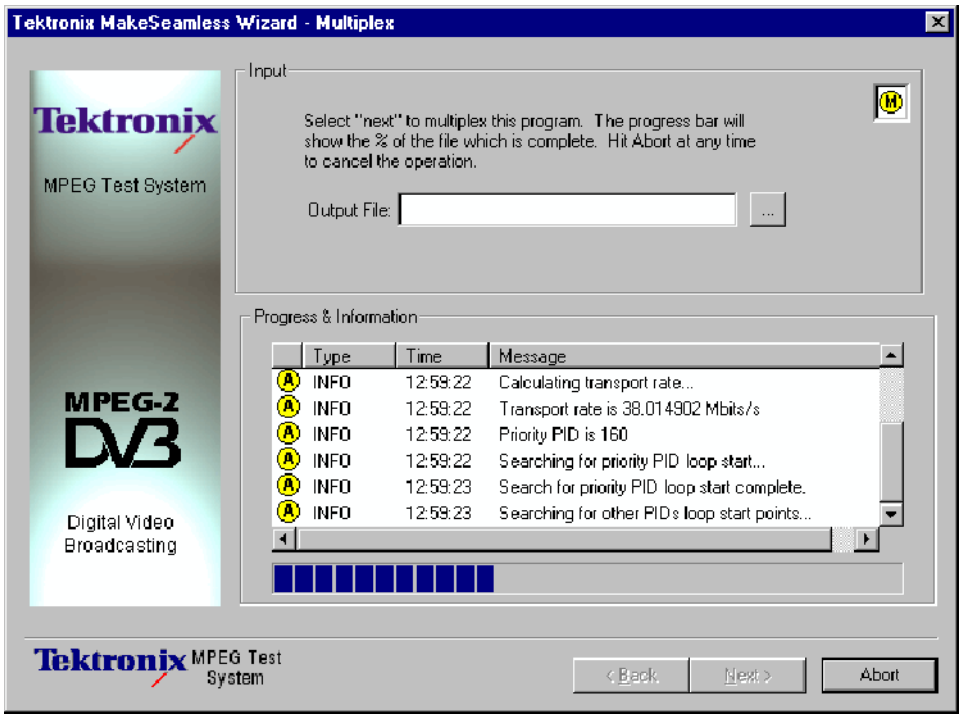
Make remaining programs seamless

If enabled, the remaining programs are made seamless but are constrained by limits defined by the priority program. This may lead to these remaining programs having a gap at the beginning and end of the file.

Make PSI/SI/PSIP seamless

The service information contained in the transport stream is processed to make it seamless.

If this checkbox is not enabled, the SI is not processed but simply copied to the output transport stream.

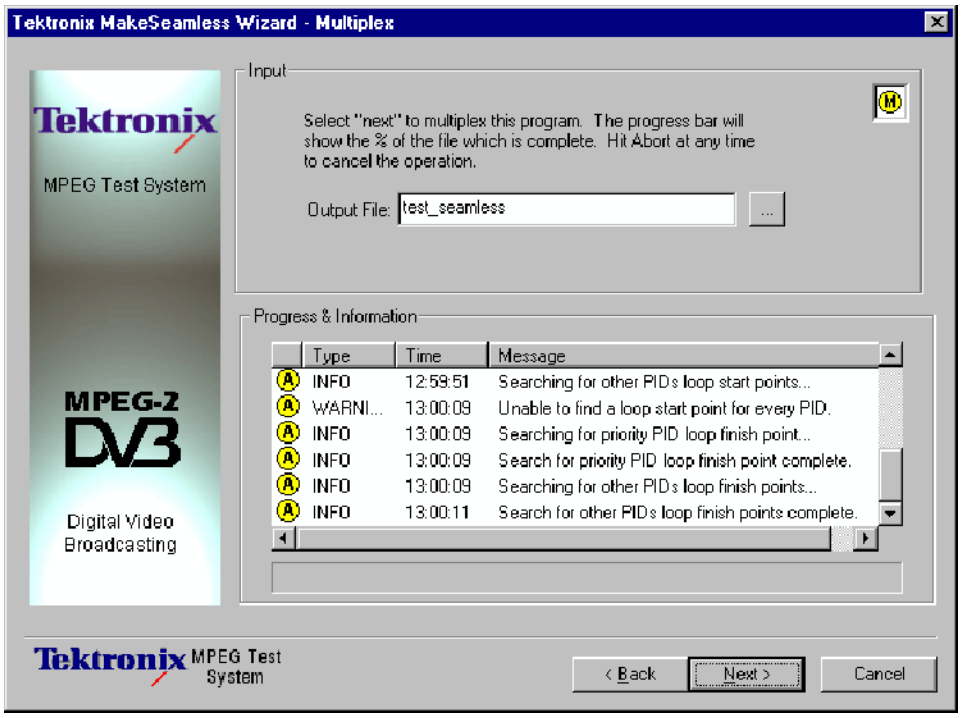

Tektronix MakeSeamless Wizard - Multiplex
Tektronix
MPEG Test System
MPEG-2
DVB
Digital Video Broadcasting
Input
Select "next" to multiplex this program. The progress bar will show the % of the file which is complete. Hit Abort at any time to cancel the operation.
Output File:
...
Progress & Information
Type
Time
Message
INFO 12:59:22 Calculating transport rate...
INFO 12:59:22 Transport rate is 38.014902 Mbits/s
INFO 12:59:22 Priority PID is 160
INFO 12:59:22 Searching for priority PID loop start...
INFO 12:59:23 Search for priority PID loop start complete.
INFO 12:59:23 Searching for other PIDs loop start points...
Tektronix MPEG Test System
< Back
Next >
Abort

Select **Next**. Once again the progress bar will indicate progress. While the stream is being analyzed, selecting the **Abort** button will stop the process and allow the program to be reselected (Note that the Abort button, which replaces the Cancel button, is only displayed during processing).

When the file has been analyzed, a number of messages will have been posted in the Progress & Information log.

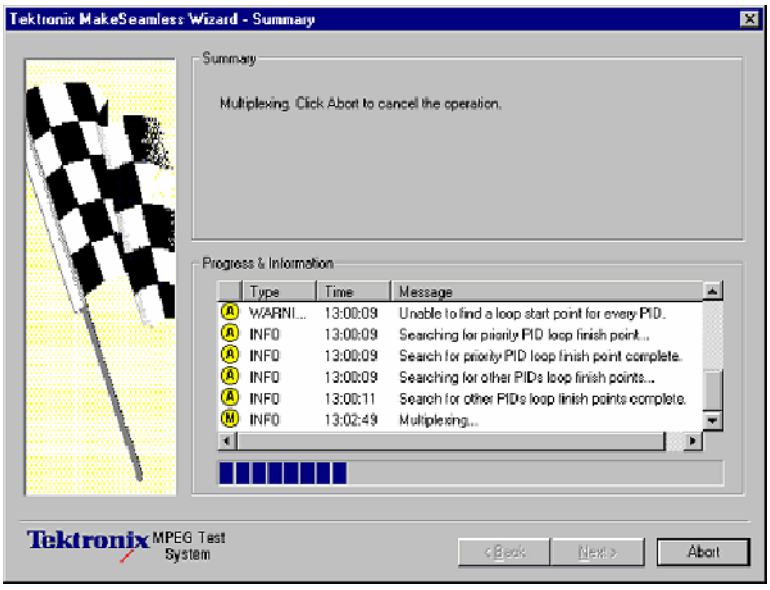
Selecting a Multiplex Output File

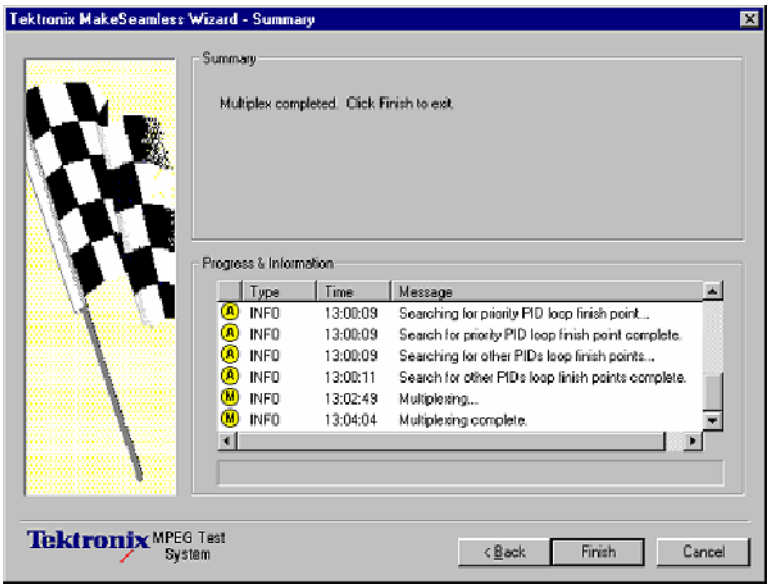
When a file has been analyzed and found suitable for making seamless, an output file must be named.


Tektronix MakeSeamless Wizard - Multiplex
Tektronix
MPEG Test System
MPEG-2
DVB
Digital Video Broadcasting
Input
Select "next" to multiplex this program. The progress bar will show the % of the file which is complete. Hit Abort at any time to cancel the operation.
Output File:
test_seamless
...
Progress & Information
Type
Time
Message
INFO 12:59:51 Searching for other PIDs loop start points...
WARNI... 13:00:09 Unable to find a loop start point for every PID.
INFO 13:00:09 Searching for priority PID loop finish point...
INFO 13:00:09 Search for priority PID loop finish point complete.
INFO 13:00:09 Searching for other PIDs loop finish points...
INFO 13:00:11 Search for other PIDs loop finish points complete.
Tektronix MPEG Test System
< Back
Next >
Cancel

A new filename can be typed or an existing file selected using the Browse button (…), in which case confirmation of the replacement will be required. Select Next to create the multiplexed output file.

The screen shown below is displayed upon completion of the process.



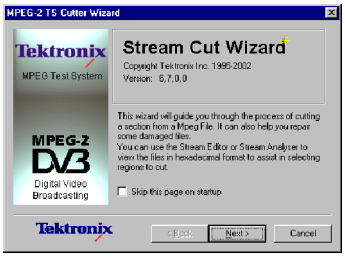


The output file will contain a program which when played out and looped with the Continuous Time Stamping option enabled will demonstrate minimal picture disturbances at the loop point.

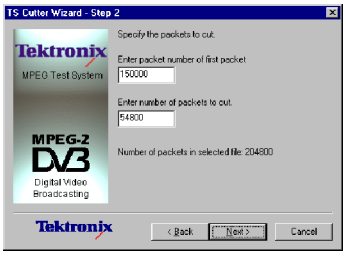
Transport Stream Cutter

Transport Stream Cutter

The Transport Stream Cutter is a wizard that creates a new file from a slice of an existing file. It is run from the Windows desktop. There are four pages including the optional introduction page:


MPEG-2 TS Cutter Wizard
Tektronix
MPEG Test System
Stream Cut Wizard
Copyright Tektronix Inc. 1995-2002
Version: 6,7,0,0
This wizard will guide you through the process of cutting a section from a Mpeg File. It can also help you repair some damaged files.
You can use the Stream Editor or Stream Analyser to view the files in hexadecimal format to assist in selecting regions to cut.
Skip this page on startup
MPEG-2
DVB
Digital Video Broadcasting
Tektronix
< Back
Next >
Cancel

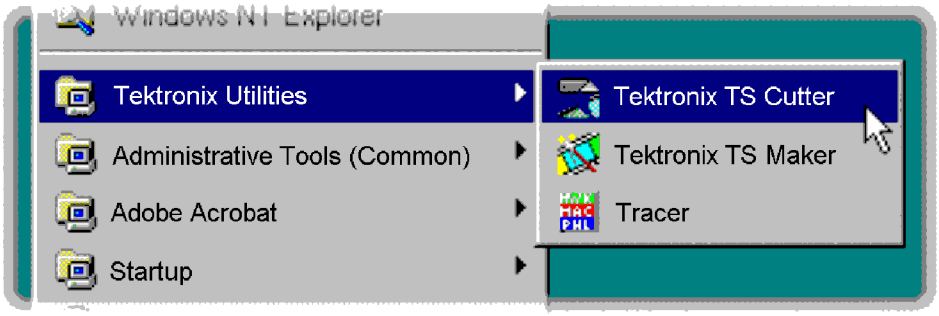
TS Cutter Wizard - Step 1
Tektronix
MPEG Test System
You can specify the source file manually, OR Drag and drop a file from an Explorer window, OR Search for the file by clicking Browse.
C:\tmp\test.mpg
Browse...
MPEG-2
DVB
Digital Video Broadcasting
Tektronix
< Back
Next >
Cancel



TS Cutter Wizard - Step 3
You can specify the destination file manually, OR Drag and drop a file from an Explorer window, OR Search for the file by clicking Browse.
c:\tmp\test_cut.mpg
Browse...
Ask before writing if file exists
Press the Finish button to begin cutting or press the Back button to review your options.
Tektronix
< Back
Finish
Cancel

Starting the Wizard

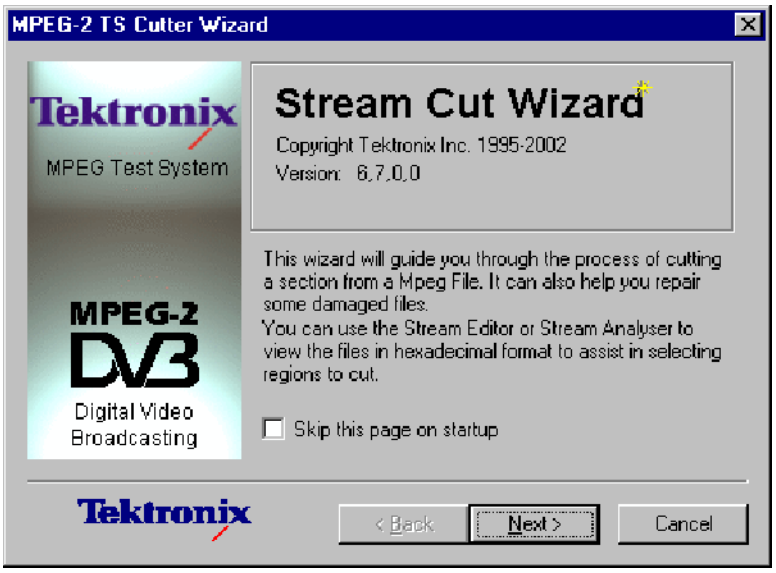
The wizard may be started by selecting the **TS Cutter** option from the **Utilities** submenu of the **Start > Programs** menu.



Alternatively, double-click on the **TS Cutter** shortcut on the desktop.

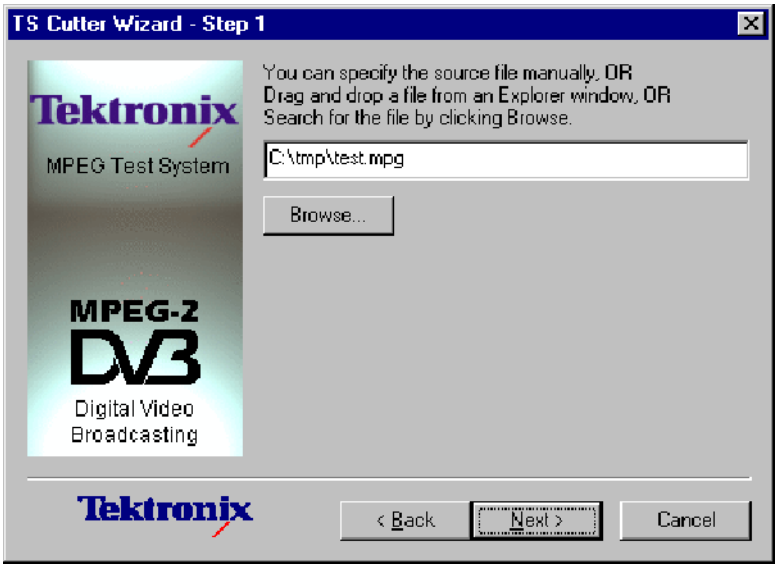
Cutting a File

By default the wizard will display this Introduction first.


MPEG-2 TS Cutter Wizard
Tektronix
MPEG Test System
MPEG-2
DVB
Digital Video
Broadcasting
Stream Cut Wizard
Copyright Tektronix Inc. 1995-2002
Version: 6,7,0,0
This wizard will guide you through the process of cutting a section from a Mpeg File. It can also help you repair some damaged files.
You can use the Stream Editor or Stream Analyser to view the files in hexadecimal format to assist in selecting regions to cut.
Skip this page on startup
Tektronix
< Back
Next >
Cancel

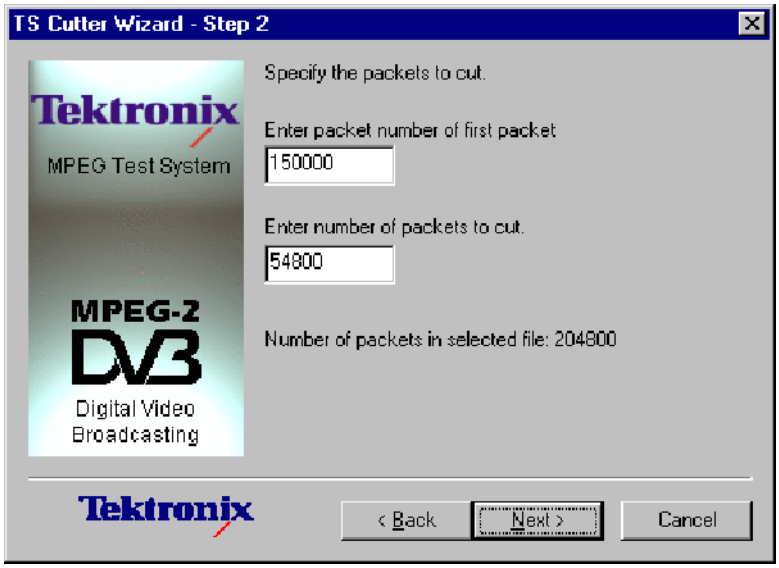
The introductory page can be disabled by checking the **Skip this page on startup** option. Select the **Next** button to move on to Step 1.

Step 1 – Specify the name and location of the source file to copy a slice from:



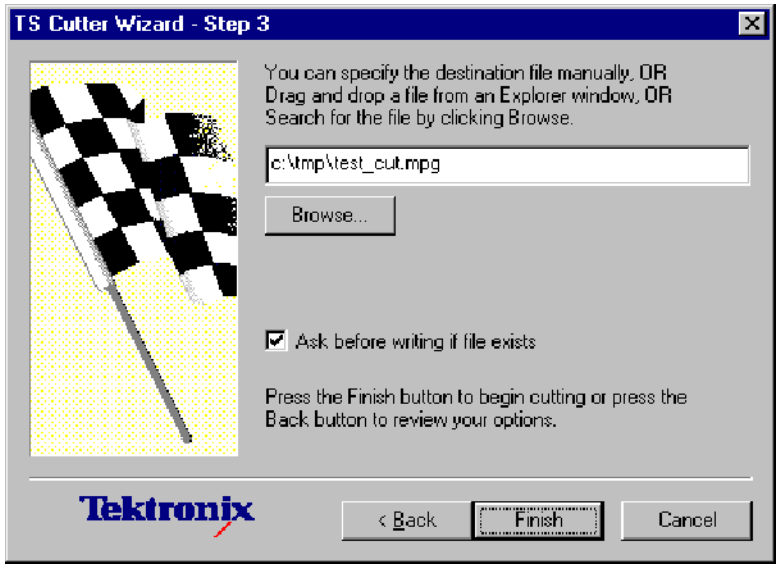
Select the **Browse...** button to open a standard file browser window to look for and choose the required file. Then select the **Next** button to move on to Step 2.

In step 2 the slice is specified by typing in the first packet and the number of packets to copy. The total number of packets in the file is also shown.



Selecting the **Back** button will return to Step 1 so that the source file name and location may be changed.

Step 3 is the last. Specify the name and location for the new file.


TS Cutter Wizard - Step 3
You can specify the destination file manually, OR
Drag and drop a file from an Explorer window, OR
Search for the file by clicking Browse.
c:\tmp\test_cut.mpg
Browse...
Ask before writing if file exists
Press the Finish button to begin cutting or press the
Back button to review your options.
Tektronix
< Back
Finish
Cancel

Select **Finish** to create the file and copy the required slice of data. Select **Back** to go back to change the source file, starting packet and number of packets.

The wizard now creates the new file and copies the selected data to the destination file specified. While it is working, this dialog box is displayed to indicate progress.

When the blue progress indicator reaches the right side the dialog box disappears and the file is ready to use.

Script Pad

Getting Started

ScriptPad is supplied with a number of Tektronix products to enable users to create and modify System Information (SI) scripts.

The rationale underlying SI Scripting is described elsewhere in this document; this section simply provides a guide to using ScriptPad.

It should be noted that script files are saved as ASCII files and that any ASCII text editor can be used to view and modify the files (for example, Microsoft Notepad). However, features such as color-coding of keywords and syntax checking will not be available; also access to encrypted script files will not be possible.

Setting Up

The ScriptPad utility is installed automatically when the system is set up. There is no additional specific set up procedure. Simple user interface management is performed from within the utility.

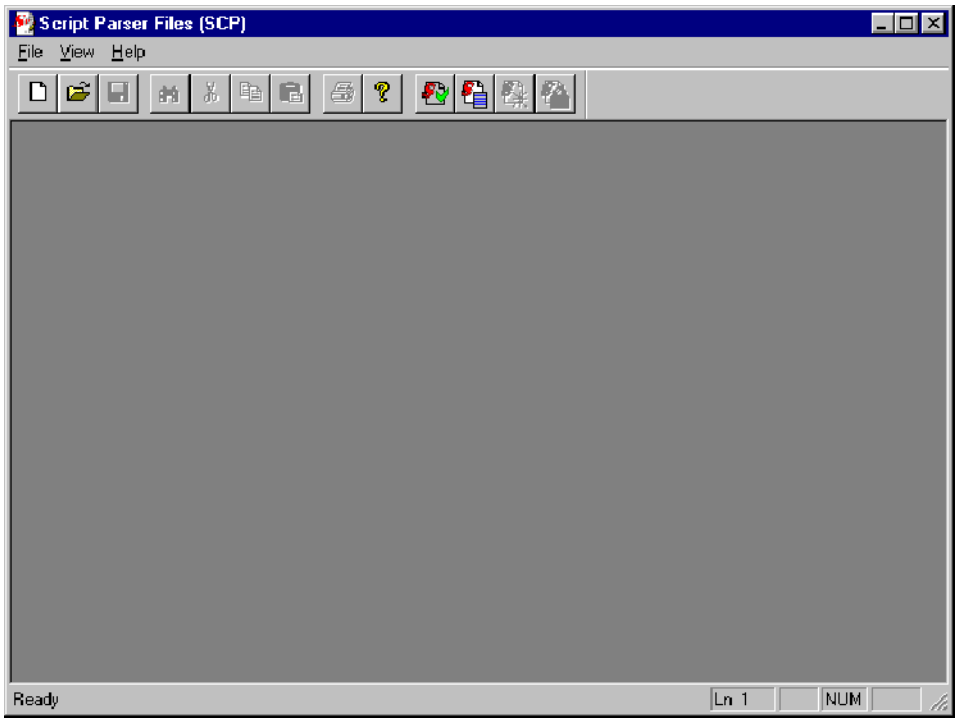
Starting the Program

ScriptPad is most often started by double-clicking an existing script file. The necessary file associations (*.scp and *.scx) are made automatically during the installation process.

Alternatively, you can start ScriptPad by clicking a shortcut placed on the desktop or by selecting ScriptPad in the Start menu in the taskbar.

Initial Appearance

When the program has started and is ready for use, the main window is displayed, as shown below:



The Toolbar (row of buttons above the dark gray area of the empty window) may be hidden from view, moved to a separate window, either side or the bottom of the main window.

The Status Line at the very bottom of the window may be hidden from view.

The dark gray area constitutes the Working Area.

Initial Menu Options

File Menu Options

Table 14–1 lists the intial File menu options.

Table 14-1: File menu options

Option	Function
New	Opens a new file.
Open…	Opens a script file (*.scp) for analysis. Choose the required file.
Print Setup…	Select which printer and associated options to use.
1 <filename> **2 <filename>** **3 <filename>** **4 <filename>**	A list of the four most recently analyzed files. If the program has recently been installed; the list may be empty or hold less than four files. Selecting a filename opens that file for analysis.
Exit	Closes the program.

View Menu Options

Table 14–2 lists the intial View menu options.

Table 14-2: File menu options

Option	Function
Toolbar	Shows or hides the toolbar.
Status Bar	Shows or hides the status bar.

Select an option to change its status.

Script File Appearance

Scripts displayed in Script Pad are color-coded to aid understanding.

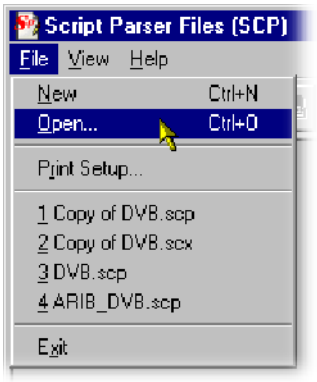
Script Pad makes no formatting corrections or changes; it is recommended that script authors use conventional programming layout.

Single line comments are prefixed with a double slash (//); in ScriptPad they are colored green. Multi-line comments of the form /*...*/ are also accepted by the parser.

Opening a File

Any script file (*.scp or *.scx) can be opened for viewing and editing by this program.

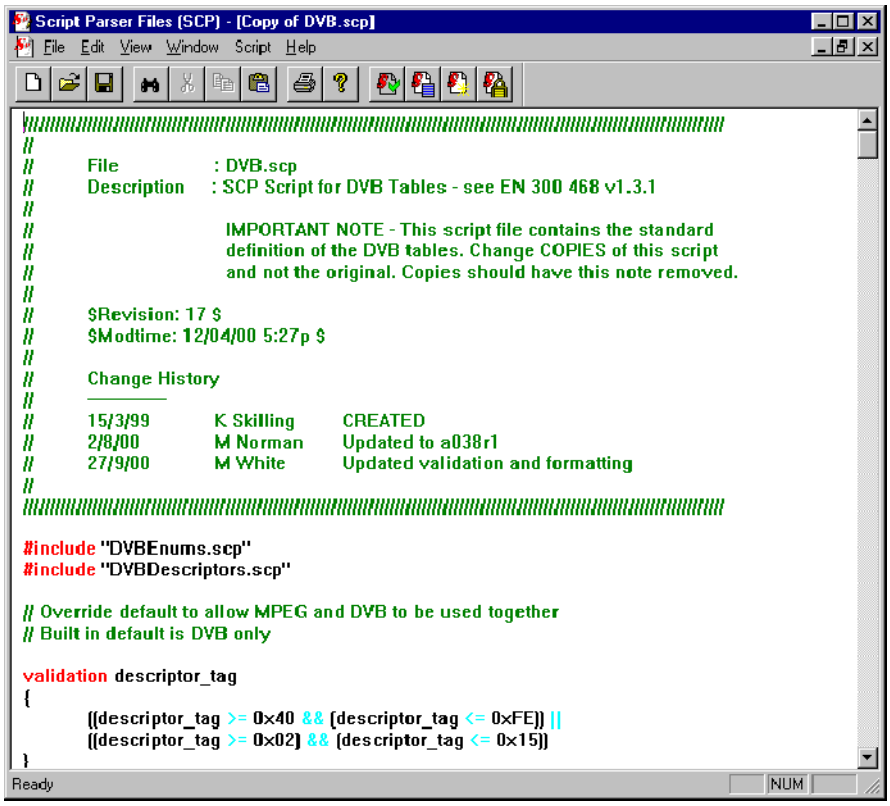
To open a file, select the **Open...** option from the file menu. If the required file is in the list of recently analyzed files, then it can be opened from the list.



Alternatively, use the Ctrl+O keyboard shortcut.

There is also a shortcut button available on the Toolbar for opening a file, which has the standard file open symbol.

On opening, the script file is displayed in the working area.


Script Parser Files (SCP) - [Copy of DVB.scp]
File Edit View Window Script Help
// File : DVB.scp
// Description : SCP Script for DVB Tables - see EN 300 468 v1.3.1
// IMPORTANT NOTE - This script file contains the standard
// definition of the DVB tables. Change COPIES of this script
// and not the original. Copies should have this note removed.
// $Revision: 17 $
// $Modtime: 12/04/00 5:27p $
// Change History
// 15/3/99 K Skilling CREATED
// 2/8/00 M Norman Updated to a038r1
// 27/9/00 M White Updated validation and formatting
#include "DVBEnums.scp"
#include "DVBDescriptors.scp"
// Override default to allow MPEG and DVB to be used together
// Built in default is DVB only
validation descriptor_tag
{
([descriptor_tag >= 0x40 && [descriptor_tag <= 0xFE]) ||
([descriptor_tag >= 0x02] && [descriptor_tag <= 0x15])
}
Ready
NUM

Viewing and editing can start immediately. Note that multiple script files can be open simultaneously.

Menu and Controls

The following pages contain descriptions of the menu options, toolbar controls, and status bar.

Menu Bar

Different menus and options are presented before and after file opening and depending upon whether the file window or the message window is active.

The Menu Bar offers all of the options available currently. Options are context sensitive; they will only be available where relevant. Some options are also available through keyboard shortcuts; these are indicated on the menus.

A check mark next to an option indicates that the function is currently visible or active; no check mark means that it is hidden or inactive.

File Menu Options

Table 14–3 list the File menu options.

Table 14-3: File menu options

Option	Function
New	Opens a new file.
Open…	Opens a script file (*.scp) for analysis. The program opens the file selection dialog box allowing the user to choose the required file.
Close	Closes the active script file window.
Save	Saves the active script file window.
Save As…	Allows the active script file to be saved under a different file name.
Encrypt	When enabled, scripts will be saved in encrypted format (*.scx) and unencrypted format (*.scp).
Print…	Opens Print dialog.
Print Preview	Previews print using current print settings.
Print Setup…	Opens a dialog for selecting which printer and associated options to use.
1 <filename> **2 <filename>** **3 <filename>** **4 <filename>**	A list of the four most recently analyzed files. If the program has recently been installed the list may be empty or hold less than 4 files. Selecting a filename opens that file for analysis.
Exit	Exits the program. The user is given the opportunity to save any changed script files.

Edit Menu Options

Table 14–4 lists the Edit menu options.

Table 14-4: Edit menu options

Option	Function
Cut	Delete the currently highlighted text and move it to the clipboard.
Copy	Copy the currently highlighted text to the clipboard.
Paste	Paste the contents of the clipboard to the current cursor location.
Find…	Finds and highlights the text string entered in the Find dialog.
Replace…	Finds and replaces the text string entered in the Replace dialog.
Go To…	Places the cursor at the specified line number.

View Menu Options

Table 14–5 lists the View menu options.

Table 14-5: View menu options

Option	Function
Toolbar	Shows or hides the Toolbar.
Status Bar	Shows or hides the Status Bar.
Auto Syntax Highlights	When enabled, automatically color-codes keywords in the active file as they are typed during editing.
Refresh Syntax Colors	Refreshes color coding of keywords in the active file.

Window Menu Options

Table 14–6 lists the Window menu options.

Table 14-6: Window menu options

Option	Function
New Window	Opens a new empty window.
Cascade	Cascades all open windows in the application.
Tile	Tiles all open windows in the application.
Arrange Icons	Aligns icons of any minimized windows at the bottom of the program's main window.
1 <window title>	List the currently open windows. The active (visible) window is indicated by the checkmark.

Script Menu Options

Table 14–7 lists the Script menu options.

Table 14-7: Script menu options

Option	Function
Parse	Parses the script file to check for syntax errors.
Script Message Log	Opens the parser message window.

Help Menu Options

Table 14–8 lists the Help menu options.

Table 14-8: Help menu options

Option	Function
About ScriptPad…	Opens the About dialog which displays the program version number.

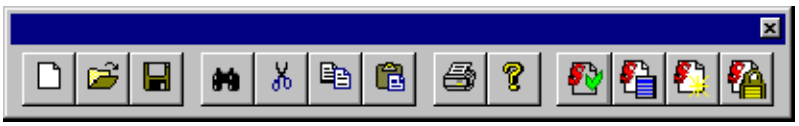
Toolbar

The Toolbar provides a set of convenient shortcuts for the more frequently used menu options. The available commands are:

	Open a new file.
	Allows an existing script file to be selected and opened.
	Saves the active script file.
	Finds specified text.
	Allows the currently selected text to be cut. It can then be pasted to another location.
	Allows the currently selected text to be copied. It can then be posted to another location.
	Allows text currently held on the clipboard (having been previously cut or copied from elsewhere) to be pasted to the cursor location.
	Allows the active script to be printed.

	Opens the About ScriptPad dialog.
	Parses the currently active script for syntax errors.
	Toggles the display of the Script Parser Messages window.
	Allows the color-coded highlights in the active script to be refreshed.
	Enables encryption. Scripts saved while this function is enabled will be saved in encrypted format (*.scx) and encrypted format (*.scp).

The Toolbar can be dragged off the edge of the main window into a floating pallet. To do this click on the background inside the Toolbar, that is, not on one of the buttons, and drag into the main window area. The result is a self contained window which looks like this:



To replace the Toolbar on the window border drag it over the border until the outline changes shape. It can be placed on the top, bottom, left or right edges.

Status Bar

The Status Bar displays an information message when the cursor is placed over any toolbar button or menu option.

Script File Editing and Encryption

Because script files are saved as ASCII files, editing follows normal text editing customs. However, ScriptPad does provide extra features to enhance and verify the process.

Keyword Color-Coding

When the **Auto Syntax Highlights** option in the **View** menu is enabled, keywords are automatically color-coded as they are typed.

When the **Auto Syntax Highlights** option is disabled, the color-coding can be refreshed by selecting the **Refresh Syntax Colors** option in the **View** menu.

Parsing

Script files can be syntactically checked by selecting the **Parse** option from the **Script** menu. A message box will indicate that errors were or were not found in the file. The Script Parser Message window will be automatically opened when the message is acknowledged.

Script Parser Message Window

The Script Parser Messages window logs the parsing activities and provides errors and warnings when necessary.

The following icons are used in the message window.

Information Error Warning

Double-clicking and error message will bring the associated script file window to the front of the display.

Messages can be cleared from the window by right-clicking anywhere within the message window and selecting **Clear messages**.

Encryption

There are an increasing number of proprietary standards emerging whereby analysis is allowable (possibly subject to a licence fee), but the owner of the standard does not want the script file to be viewed by users. This is solved by using encrypted script files. The ScriptPad utility, which is used for creating and editing script files has an Encrypt option, such that a script file is saved in an unreadable encrypted format, that only the ScriptParser can interpret. ScriptPad is associated with the .scp and .scx suffixes used for unencrypted and encrypted scripts respectively during the installation process.

The script encryption process employs a robust, 128 bit symmetric-key algorithm based on the Feistel block cipher, which is similar to that used in the dongle encryption scheme. Additional functions have been included to increase the entropy of the cipher text.

Each time a script is encrypted, a unique file is generated. This makes it hard to determine the algorithm by making small changes to plain-text and then observing the change made to the cipher-text. In addition the cipher-text is protected from interference, meaning that changes to the cipher text are detected on decryption and the altered file will be rejected.

***NOTE**. A dongle is a security or copy protection device that must be connected to an I/O port of the computer while the program is run. Programs that use a dongle may query the port at start-up and at programmed intervals thereafter, and terminate if it does not respond with the expected validation code.*

Glossary

Glossary

Accuracy	The closeness of the indicated value to the true value.
AIT	Application Information Table
ASCII	American Standard Code for Information Interchange
ATSC	Advanced Television Systems Committee
CAT	Conditional Access Table (MPEG)
CDT	Carrier Definition Table
CVCT	Cable Virtual Channel Table (ATSC)
DSM-CC	Digital Storage Media - Command and Control
EIT	Event Information Table (DVB/ATSC)
ES	Elementary Stream
ETT	Extended Text Table (ATSC)
MGT	Master Guide Table (ATSC)
MMT	Modulation Mode Table
NIT	Network Information Table (DVB)
PAT	Program Association Table (MPEG)
PES	Packetized Elementary Stream
PID	Packet IDentifier
PIT	Program Information Table (ATSC)
PMT	Program Map Table (MPEG)
PSI	Program Specific Information (MPEG)
PSIP	Program and System Information Protocol (ATSC)
RAID	Redundant Array of Independent Disks
RRT	Regional Ratings Table (ATSC)
RST	Running Status Table (DVB)
SDT	Service Description Table (DVB)

SI	Service Information (DVB)
SIT	Satellite Information Table
STT	System Time Table (ATSC)
TDT	Time and Date Table (DVB)
TDT	Transponder Data Table (ATSC)
TNT	Transponder Name Table
TOT	Time Offset Table (DVB)
TS	Transport Stream
TSTD	Transport Streams Description Table
T-STD	Transport Stream System Target Decoder
TVCT	Terrestrial Virtual Channel Table (ATSC)
UTC	Universal Co-ordinated Time
VCT	Virtual Channel Table (ATSC)
XML	Extensible Markup Language

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - FAX 781.665.0780 - TestEquipmentDepot.com